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Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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VOLUME 23 NUMBER 12 / JUNE 23, 1985

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 1769

02 AERODYNAMICS 1770
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.
For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 1773
Includes passenger and cargo air transport operations; and aircraft accidents.
For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 1774
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.
For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 1776
Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 1777
Includes cockpit and cabin display devices; and flight instruments.
For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 1778
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.
For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 1780
Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 1781
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.
For related information see also *14 Ground Support Systems and Facilities (Space)*.

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 1782
For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 1788
Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 1789
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.
For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 1791
Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 1792
Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.
For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

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Includes telemetry; space communications networks; astronavigation; and radio blackout.
For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1792

Includes spacecraft thermal and environmental control; and attitude control.
For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 1794
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 1794
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
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Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 1796
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 1798
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 1804
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 1809
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 1816
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
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For related information see also *Physics.*

31 ENGINEERING (GENERAL) 1818
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 1821
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 1832
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 1844
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 1848
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 1855
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 1857
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38 QUALITY ASSURANCE AND RELIABILITY 1861
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 1863
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

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For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 1869
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 1876
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For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 1883
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 1887
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

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Includes biological, dynamic and physical oceanography; and marine resources.

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Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) **1899**
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52 AEROSPACE MEDICINE **1904**
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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **1910**

60 COMPUTER OPERATIONS AND HARDWARE **1911**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **1912**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS **1918**
Includes computer networks.

63 CYBERNETICS **1918**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **1919**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **1923**
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66 SYSTEMS ANALYSIS **1924**
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For related information see also *Engineering.*

70 PHYSICS (GENERAL) **1926**
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS **1927**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **1928**
Includes atomic structure and molecular spectra.

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Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **1932**
Includes light phenomena.

75 PLASMA PHYSICS **1935**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **1938**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **1943**
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For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) **1944**
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81 ADMINISTRATION AND MANAGEMENT **1949**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **1951**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **N.A.**
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **N.A.**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **1952**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **1952**

89 ASTRONOMY **1953**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1953**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1960**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1961**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **N.A.**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

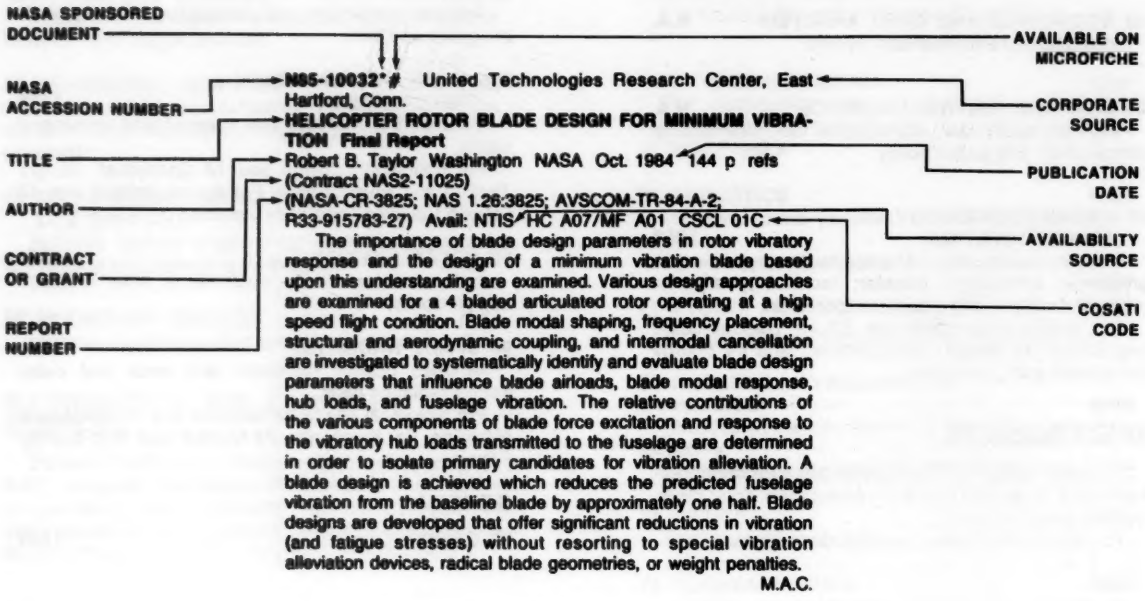
GENERAL

99 GENERAL **1963**

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX **I-1**
PERSONAL AUTHOR INDEX **I-73**
CORPORATE SOURCE INDEX **I-83**
CONTRACT NUMBER INDEX **I-99**
REPORT / ACCESSION NUMBER INDEX **I-103**

TYPICAL CITATION AND ABSTRACT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N85-10032* # United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
PUBLICATION DATE
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(Contract NAS2-11025)
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(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
AVAILABILITY SOURCE
COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 12 JUNE 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-21103# Transportation Systems Center, Cambridge, Mass.
GENERAL AVIATION ACTIVITY AND AVIONICS SURVEY Annual Summary Report, for CY 1983
J. C. Schwenk Oct. 1984 229 p
(AD-A149572; DOT-TSC-FAA-84-3; FAA-MS-84-5) Avail: NTIS HC A11/MF A01 CSCL 01/3

This report presents the results and a description of the 1983 General Aviation Activity and Avionics Survey. The survey was conducted during 1984 by the FAA to obtain information on the activity and avionics of the United States registered general aviation aircraft fleet, the dominant component of civil aviation in the U.S. The survey was based on a statistically selected sample of about 10.7 percent of the general aviation fleet and obtained a response rate of 62 percent. Survey results are based upon responses but are expanded upward to represent the total population. Survey results revealed that during 1983 an estimated 35.2 million hours of flying time were logged by the 213,293 active general aviation aircraft in the U.S. fleet, yielding a mean annual flight time per aircraft of 164 hours. The active aircraft represented about 82 percent of the registered general aviation fleet. The report contains breakdowns of these and other statistics by manufacturer/model group, aircraft type, state and region of based aircraft, and primary use. Also included are fuel consumption, lifetime airframe hours, avionics, and engine hours estimates. In addition, tables are included for detailed analysis of the avionics capabilities of the GA fleet. Estimates of general aviation miles flown in 1983 have been included for the first time, broken down by aircraft type. Author (GRA)

N85-21104# Air Force Academy, Colo.
AIR FORCE ACADEMY AERONAUTICS DIGEST Final Report
J. DeJongh, W. Heiser, and M. Hale Sep. 1984 144 p
(AD-A149614; USAFA-TR-84-7) Avail: NTIS HC A07/MF A01 CSCL 01/3

This Digest covers unclassified research in aeronautics performed by individuals assigned to or associated with the United States Air Force Academy. This report includes technical papers in the specific areas of aerodynamics, propulsion, instrumentation, and engineering education. GRA

N85-21105# Joint Publications Research Service, Arlington, Va.
TRANSPORTATION
27 Feb. 1985 104 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-85-004) Avail: NTIS HC A06

This U.S.S.R. report contains research in the area of transportation. Quality control measures in civil aviation plants are investigated. The advantages of flight simulators as compared to conventional flight training methods are cited. The construction of airport facilities in Tenkeli are reported. The development and current applications of airships in the U.S.S.R. are discussed. For individual titles, see N85-21106 through N85-21109.

N85-21106# Joint Publications Research Service, Arlington, Va.
AVIATION REPAIR PLANT DIRECTORS ON QUALITY CONTROL MEASURES
In USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 1-4 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 29 Dec. 1984 and 3 Jan. 1985 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

Responses to an editorial concerning the quality of aircraft maintenance in he U.S.S.R. are reported. Special plans and measures are developed in connection with the problems raised in the article. New reserves which make it possible to improve the quality of maintenance work are also introduced. Technical control measures are investigated. B.W.

N85-21107# Joint Publications Research Service, Arlington, Va.
NEW FLIGHT SIMULATORS AT VNUKOVO PERMIT LESS IN-FLIGHT TRAINING c09
M. Blinov and V. Gurdzhiyants *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 5-7 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 15 Jan. 1985 p 3 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

The capabilities and advantages of the Vnukovo flight simulator are reported. The imitation of depth invision of the ground and surrounding objects makes it possible to provide training for crews in landing in dense fog and to master actions under particular flying conditions, bringing them as close as possible to real conditions. This simulator also permits less inflight training time. B.W.

N85-21108# Joint Publications Research Service, Arlington, Va.
NEW RUNWAY ENABLES IL-76 FLIGHTS TO TENKELI IN FAR NORTH c09
O. Borodin *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 8-9 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 8 Jan. 1985 p 1 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

The construction of an airport runway at the Tenkeli airport is discussed. Increased economic development and the arctic-like climate are major factors contributing to the need for reliable transportation. B.W.

N85-21109# Joint Publications Research Service, Arlington, Va.
CURRENT DEVELOPMENT, APPLICATIONS OF AIRSHIPS IN USSR c02
Yevgeniy Goltsman *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 95-97 Transl. into ENGLISH from Mosk. Pravda (Moscow), 18 Dec. 1984 p 3 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

A half-century ago many scientists and engineers were

convinced that airships soon would take their place among the museum exhibits. Today, they are being referred to as promising transportation in the near future. The rebirth of the airship in the U.S.S.R. as a viable means of transportation is discussed. The revival of the airship is primarily connected with the relative economy of this type of structure. B.W.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-21110*# National Aeronautics and Space Administration, Washington, D. C.

UNSTEADY AERODYNAMIC CHARACTERIZATION OF A MILITARY AIRCRAFT IN VERTICAL GUSTS

A. LeBozec and J. L. Cocquerez Feb. 1985 44 p refs Transl. into ENGLISH of Colloq. paper AAAF-NT-83-16 from Assoc. Aeron. et Astron. de France, Toulouse, 47 p Presented at the 20th Appl. Aerodyn. Colloq., Toulouse, 8-10 Nov. 1983 Original language doc. was announced in IAA as A84-32484

(NASA-TM-77810; NAS 1.15:77810; AAAF-NT-83-16) Avail: NTIS HC A03/MF A01 CSCL 01A

The effects of 2.5-m/sec vertical gusts on the flight characteristics of a 1:8.6 scale model of a Mirage 2000 aircraft in free flight at 35 m/sec over a distance of 30 m are investigated. The wind-tunnel setup and instrumentation are described; the impulse-response and local-coefficient-identification analysis methods applied are discussed in detail; and the modification and calibration of the gust-detection probes are reviewed. The results are presented in graphs, and good general agreement is obtained between model calculations using the two analysis methods and the experimental measurements. Author

N85-21111*# National Aeronautics and Space Administration, Washington, D. C.

THREE-DIMENSIONAL UNSTEADY LIFTING SURFACE THEORY IN THE SUBSONIC RANGE

H. G. Kuessner Feb. 1985 37 p refs Transl. into ENGLISH of "Dreidimensionale instationaere tragflaechentheorie im unterschallgebiet" Goettingen, West Germany, 1956 Presented at 2nd European Aeron. Congr., Scheveningen, Netherlands, 25-29 Sep. 1956 Transl. by Corporate Word, Pittsburgh Original document prepared by Max-Planck-Inst. of Flow Research, Goettingen, West Germany

(Contract NASw-4006)

(NASA-TM-77812; NAS 1.15:77812) Avail: NTIS HC A03/MF A01 CSCL 01A

The methods of the unsteady lifting surface theory are surveyed. Linearized Euler's equations are simplified by means of a Galileo-Lorentz transformation and a Laplace transformation so that the time and the compressibility of the fluid are limited to two constants. The solutions to this simplified problem are represented as integrals with a differential nucleus; these results in tolerance conditions, for which any exact solution must suffice. It is shown that none of the existing three-dimensional lifting surface theories in subsonic range satisfy these conditions. An oscillating elliptic lifting surface which satisfies the tolerance conditions is calculated through the use of Lame's functions. Numerical examples are calculated for the borderline cases of infinitely stretched elliptic lifting surfaces and of circular lifting surfaces. Out of the harmonic solutions any such temporal changes of the down current are calculated through the use of an inverse Laplace transformation. M.G.

N85-21112*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

RECONSTRUCTION OF A 3-DIMENSIONAL TRANSONIC ROTOR FLOW FIELD FROM HOLOGRAPHIC INTERFEROGRAM DATA

Yung H. Yu, John K. Kittleson, and Friedhelm Becker (Max-Planck Inst. fuer Stroemungsforschung, Goettingen, West Germany) Mar. 1985 29 p refs

(NASA-TM-86690; Rept-85147; NAS 1.15:86690; USAAVSCOM-TR-85-A-1) Avail: NTIS HC A03/MF A01 CSCL 01A

Holographic interferometry and computer-assisted tomography (CAT) are used to determine the transonic velocity field of a model rotor blade in hover. A pulsed ruby laser recorded 40 interferograms with a 2-ft-diam view field near the model rotor-blade tip operating at a tip Mach number of 0.90. After digitizing the interferograms and extracting fringe-order functions, the data are transferred to a CAT code. The CAT code then calculates the perturbation velocity in seeral planes above the blade surface. The values from the holography-CAT method compare favorably with previously obtained numerical computations in most locations near the blade tip. The results demonstrate the technique's potential for three-dimensional transonic rotor flow studies. Author

N85-21113*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRANSONIC INTERACTIONS OF UNSTEADY VORTICAL FLOWS

W. J. McCroskey and G. R. Srinivasan (JAI Associates, Mountain View, Calif.) Dec. 1984 16 p refs Sponsored in part by Army

(NASA-TM-86658; Rept-85075; NAS 1.15:86658; USAAVSCOM-TM-84-A-10) Avail: NTIS HC A02/MF A01 CSCL 01A

Unsteady interactions of strong concentrated vortices, distributed gusts, and sharp-edged gusts with stationary airfoils were analyzed in two-dimensional transonic flow. A simple and efficient method for introducing such vortical disturbances was implemented in numerical codes that range from inviscid transonic small disturbance to thin-layer Navier Stokes. The numerical results demonstrate the large distortions in the overall flow field and in the surface air loads that are produced by various vortical interactions. The results of the different codes are in excellent qualitative agreement, but, as might expected, the transonic small-disturbance calculations are deficient in the important region near the leading edge. M.G.

N85-21114*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRELIMINARY ANALYSIS OF TONE-EXCITED TWO-STREAM JET VELOCITY DECAY

U. H. vonGlahn 1985 22 p refs Presented at the 109th Meeting of the Acoustical Society of America, Austin, Tex., 8-12 Apr. 1985

(NASA-TM-86951; E-2473; NAS 1.15:86951) Avail: NTIS HC A02/MF A01 CSCL 01A

Acoustic research related to jet flows has established that sound, by amplifying the naturally occuring large-scale structures in turbulent shear layers, can cause a more rapidly decay of the jet plume velocity and temperature and an increase in jet spreading rate. One possible application of this sound-flow interaction phenomenon is to future STOL aircraft that may require modified jet plume characteristics in order to reduce the loads and temperatures on the deflected flaps during take-off and landing operations. The tone-excitation effect on the velocity decay of model-scale, two-stream jet plumes is analyzed. Measured data are correlated in terms of parameters that include excitation sound level and outer-to-inner stream velocity ratio. The effect of plume tone-excitation on far-field jet noise is examined and its implication for large-scale two-stream jets is discussed. A.R.H.

N85-21115*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ADVANCED LINER-COOLING TECHNIQUES FOR GAS TURBINE COMBUSTORS

Carl T. Norgren and Steven M. Riddlebaugh 1985 21 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and

ASME
(NASA-TM-86952; E-2475; NAS 1.15:86952) Avail: NTIS HC A02/MF A01 CSCL 21E

Component research for advanced small gas turbine engines is currently underway at the NASA Lewis Research Center. As part of this program, a basic reverse-flow combustor geometry was being maintained while different advanced liner wall cooling techniques were investigated. Performance and liner cooling effectiveness of the experimental combustor configuration featuring counter-flow film-cooled panels is presented and compared with two previously reported combustors featuring: splash film-cooled liner walls; and transpiration cooled liner walls (Lamilloy). Author

N85-21116*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEASURED UNSTEADY TRANSONIC AERODYNAMIC CHARACTERISTICS OF AN ELASTIC SUPERCRITICAL WING WITH AN OSCILLATING CONTROL SURFACE
David A. Seidel, Maynard C. Sandford, and Clinton V. Eckstrom Feb. 1985 10 p refs Presented at the AIA/ASME/ASCE/AHS 26th Struct., Struct. Dyn. and Mater. Conf., Orlando, Fla., 15-17 Apr. 1985
(NASA-TM-86376; NAS 1.15:86376; AIAA-85-0598-CP) Avail: NTIS HC A02/MF A01 CSCL 01A

Transonic steady and unsteady aerodynamic data were measured on a large elastic wing in the NASA Langley Transonic Dynamics Tunnel. The wing had a supercritical airfoil shape and a leading-edge sweepback of 28.8 deg. The wing was heavily instrumented to measure both static and dynamic pressures and deflections. A hydraulically driven outboard control surface was oscillated to generate unsteady airloads on the wing. Representative results from the wind tunnel tests are presented and discussed, and the unexpected occurrence of an unusual dynamic wing instability, which was sensitive to angle of attack, is reported. M.G.

N85-21117*# Cornell Univ., Ithaca, N.Y. School of Mechanics and Aerospace Engineering.
A THEORY OF POST-STALL TRANSIENTS IN MULTISTAGE AXIAL COMPRESSION SYSTEMS Final Report
F. K. Moore and E. M. Greitzer Washington NASA Mar. 1985 115 p refs Prepared in cooperation with M.I.T., Cambridge)
(Grants NAG3-34; NsG-3208)
(NASA-CR-3878; NAS 1.26:3878) Avail: NTIS HC A06/MF A01 CSCL 01A

A theory is presented for post stall transients in multistage axial compressors. The theory leads to a set of coupled first-order ordinary differential equations capable of describing the growth and possible decay of a rotating-stall cell during a compressor mass-flow transient. These changing flow features are shown to have a significant effect on the instantaneous compressor pumping characteristic during unsteady operation, and henace on the overall system behavior. It is also found from the theory that the ultimate mode of system response, stable rotating stall or surge, depends not only on the B parameter but also on other parameters, such as the compressor length-to-diameter ratio. Small values of this latter quantity tend to favor the occurrence of surge, as do large values of B. A limited parametric study is carried out to show the impact of the different system features on transient behavior. Based on analytical and numerical results, several specific topics are suggested for future research on post-stall transients. M.G.

N85-21118*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLIGHT-MEASURED LAMINAR BOUNDARY-LAYER TRANSITION PHENOMENA INCLUDING STABILITY THEORY ANALYSIS
Clifford J. Obara (Kentron International, Inc.) and Bruce J. Holmes Apr. 1985 40 p refs
(NASA-TP-2417; L-15804; NAS 1.60:2417) Avail: NTIS HC A03/MF A01 CSCL 01A

Flight experiments were conducted on a single-engine turboprop aircraft fitted with a 92-in-chord, 3-ft-span natural laminar flow glove at glove section lift coefficients from 0.15 to 1.10. The boundary-layer transition measurement methods used included sublimating chemicals and surface hot-film sensors. Transition occurred downstream of the minimum pressure point. Hot-film sensors provided a well-defined indication of laminar, laminar-separation, transitional, and turbulent boundary layers. Theoretical calculations of the boundary-layer parameters provided close agreement between the predicted laminar-separation point and the measured transition location. Tollmien-Schlichting (T-S) wave growth n-factors between 15 and 17 were calculated at the predicted point of laminar separation. These results suggest that for many practical airplane cruise conditions, laminar separation (as opposed to T-S instability) is the major cause of transition in predominantly two-dimensional flows. Author

N85-21119*# Texas A&M Univ., College Station.
PROPELLER PROPULSION SYSTEM INTEGRATION: STATE OF TECHNOLOGY SURVEY Final Report
S. J. Miley and E. vonLavante Washington Mar. 1985 186 p (Grant NAG1-214)
(NASA-CR-3882; NAS 1.26:3882) Avail: NTIS HC A09/MF A01 CSCL 01B

A literature survey was performed to identify and review technical material applicable to the problem area of propeller propulsion system integration. The survey covered only aerodynamic interference aspects of the problem, and was restricted primarily to propeller effects on the airframe. The subject of airframe aerodynamic interference on the propeller was limited to the problem of vibration due to nonuniform inflow. The problem of airframe effects on propeller performance was not included. A total of 1121 references are given. The references are grouped into the subject areas of Aircraft Stability, Propulsive Efficiency, Aerodynamic Interference, Aerodynamic Interference-Propeller Vibration, and Miscellaneous. Author

N85-21120*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEMIANALYTIC MODELING OF AERODYNAMIC SHAPES
Raymond L. Barger and Mary S. Adams Apr. 1985 20 p refs
(NASA-TP-2413; L-15879; NAS 1.60:2413) Avail: NTIS HC A02/MF A01 CSCL 01A

Equations for the semianalytic representation of a class of surfaces that vary smoothly in cross-sectional shape are presented. Some methods of fitting together and superimposing such surfaces are described. A brief discussion is also included of the application of the theory in various contexts such as computerized lofting of aerodynamic surfaces and grid generation. Author

N85-21121# National Research Council of Canada, Ottawa (Ontario).
A STUDY OF TRANSONIC FLUTTER OF A TWO-DIMENSIONAL AIRFOIL USING THE U-g AND p-k METHODS
B. H. K. Lee Nov. 1984 70 p refs
(LR-615; NRC-23959) Avail: NTIS HC A04/MF A01

Transonic flutter of a NACA64A006 airfoil undergoing plunging and pitching oscillations is studied using the U-g and p-k methods. The aerodynamic coefficients are calculated using an improved version of an ONERA unsteady transonic aerodynamics code which include the second time derivation term of the velocity potential in the governing equation. Comparisons with LTRAN2-NLR show good agreement up to and in some cases exceeding K sub c = 0.4 except for the pitching moment curves at the transonic dip Mach number of 0.85. All flutter results are presented for M = 0.85. The p-k method gives flutter speeds identical to those from the U-g method. Subcritical damping ratios using the U-g method with Frueh's and Miller's damping formula are quite close to those obtained from the p-k method, especially for large values of the airfoil-air mass ratio. Response of the airfoil to externally applied forces and moments is studied using the p-k method and a viscous damping model for coupled motions. Author

N85-21122# Aeronautical Research Labs., Melbourne (Australia).
DESCRIPTION OF A TECHNIQUE TO MEASURE SPRAY DIS-

TRIBUTION IN AN AIR STREAM
J. C. Payne Feb. 1984 16 p
(AD-A149780; ARL-AERO-PROP-TM-417) Avail: NTIS HC A02/MF A01 CSCL 14/2

This Australian report describes a technique for the measurement of the distribution of introduced liquid mist within an air flow in an annular duct. These measurements were required as part of a program to develop a system for injecting a mixture of water and methanol into the compressor of a small gas turbine. GRA

N85-21123# Grumman Aerospace Corp., Bethpage, N.Y.
AN INVESTIGATION OF TURBULENCE MECHANISMS IN V/STOL UPWASH FLOW FIELDS Annual Report, 15 Mar. 1983 - 15 Jun. 1984
B. L. Gilbert 31 Aug. 1984 59 p
(Contract F49620-82-C-0025)
(AD-A149786; RE-688; AFOSR-84-1197TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

This study investigated the two-dimensional upwash region formed by collision of opposed two-dimensional wall jets. Extensive measurements were made in the 2-D wall jet to establish the starting conditions of the upwash. Evaluation of these measurements showed classical wall jet behavior, and fully developed mean and turbulence profiles at the collision zone. A unique set of velocity profiles was obtained at seven upwash locations. Two components of the velocity were found simultaneously using an X-probe anemometer. By rotating the probe and repeating the profiles, all three velocity components were measured. While mixing layer growth rates were larger than those found in a free two-dimensional jet, these values were less than those previously reported. These data are presented in similarity form. Higher moments and some of the terms in the turbulence kinetic energy equation were also measured. As part of the study of the effect of various initial conditions, a series of measurements was taken in the upwash formed by collision of unequal wall jets. These are compared to a very simple theory. By choosing a coordinate system aligned with the upwash, these data can be characterized in a pattern similar to the equal wall jet case. Obstacles of various heights were placed at the collision point of equal wall jets. Away from the influences of the obstacle's wake, the upwash exhibited increasing decay rates with decreasing obstacle heights. This behavior asymptotes to the no-obstacle case for small obstacles and to twice the wall jet growth for large obstacles. GRA

N85-21124# Flow Research, Inc., Kent, Wash.
UNSTEADY FLOWS AROUND 3-DIMENSIONAL WINGS Final Technical Report, 1 May 1983 - 30 Sep. 1984
M. Gad-el-Hak 1 Oct. 1984 90 p
(Contract F49620-82-C-0020)
(AD-A149993; FRC-RR-305; AFOSR-84-1243TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

Time-dependent flows around rectangular, swept or delta wings undergoing harmonic pitching motions were investigated using flow visualization techniques. The wings were towed in an 18-m water channel at chord Reynolds numbers up to 350,000. Fluorescent dye layers were excited with a sheet of laser light and used to mark the flow in the separation region around the lifting surface, the wake region and the potential flow away from the wing. The flow field around each wing depends to a large degree on wing planform, leading edge contour, and the reduced frequency of oscillation. The results can be mostly explained in terms of the mutual induction between the leading edge separation vortex and the trailing edge shedding vortex. For steady state flow around the delta wing (constant angle of attack and constant speed), the present visualization experiments revealed the existence of a shear layer near the leading edge that rolls up and form discrete vortices parallel to the leading edge. These vortices were observed to pair at least once as they were convected downstream. Similar phenomena were observed in the unsteady case, except that the vortices shed from the leading edge were modulated and altered by the unsteady motion which was an order of magnitude lower in frequency. In general, the unsteadiness delayed separation and promoted hysteresis similar to results obtained in unsteady two-dimensional airfoils. Keywords include: Unsteady separated flows; Three-dimensional wings, Pitching wings, and Supermaneuverability. GRA

N85-21125# National Aeronautical Establishment, Ottawa (Ontario).
SKIN FRICTION MEASUREMENTS FOR 2 RELATIVELY THICK AIRFOIL SECTIONS AT HIGH REYNOLDS NUMBER Aeronautical Note
G. M. Elfstrom Nov. 1984 86 p
(AD-A150021; NAE-AN-23; NRC-23941) Avail: NTIS HC A05/MF A01 CSCL 20/4

This Canadian report describes an experimental investigation of turbulent skin friction for two airfoil sections under conditions of high Reynolds number. Data are presented for an NACA 0020 section at a Mach number of 0.30 and chord Reynolds numbers between 5 and 20 million, and for a 16% thick supercritical section at a Mach number of 0.74 and chord Reynolds numbers between 15 and 25 million. Together with estimates of boundary layer transition location, these data are integrated to determine the skin friction component of total drag. The results are then discussed in terms of observed variation of total drag with Reynolds number. GRA

N85-21126# Flow Research, Inc., Kent, Wash. Research and Technology Div.
PSEUDOSPECTRAL CALCULATIONS OF TWO-DIMENSIONAL TRANSONIC FLOW (TASK 1). NUMERICAL INVESTIGATION OF VTOL AERODYNAMICS (TASK 2) Final Progress Report, 22 Dec. 1981 - 21 Dec. 1983
Wen Huei Jou and R. W. Metcalfe Sep. 1984 98 p
(Contract F49620-82-C-0022; AF Proj. 2307)
(AD-A150123; TN-215; TN-216; AFOSR-84-1174TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

The status of the research performed under this AFOSR contract is reported in two Flow Research Technical Notes. The formulation of the problem, the method of solution, and numerically obtained results are presented for each case. GRA

N85-21127# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TECHNIQUES TO ANALYZE VEHICLE COASTDOWN DATA
James R. Venhuizen Oct. 1984 41 p ref
(Contract DE-AC07-76ID-01570)
(DE85-005159; EGG-ED-6725) Avail: NTIS HC A03/MF A01

Vehicle coastdown tests were used for some time to generate data for estimating aerodynamic drag and tire rolling resistance. In spite of the numerous methods and techniques written up in the literature, the data taken do not represent measurements of the parameters of interest, rather, these parameters must be estimated from the measured data using some type of parameter estimation methodology. A method is presented which uses least squares parameter estimation techniques to estimate the aerodynamic drag and rolling resistance coefficients from velocity versus time data taken during the coastdown. Central to any parameter estimation problem is a model of the process that contains the parameters of interest. A model is developed to describe the coastdown process, and an example problem presented to show the computational methods developed for the data reduction process. DOE

N85-21128# Sandia Labs., Albuquerque, N. Mex.
TAILORED AIRFOILS FOR VERTICAL AXIS WIND TURBINES
Paul C. Klimas Nov. 1984 13 p refs
(Contract DE-AC04-76DP-00789)
(DE85-004628; SAND-84-1062) Avail: NTIS HC A02/MF A01

The evolution of a family of airfoil sections designed to be used as blade elements of a vertical axis wind turbine (VAWT) is described. This evolution consists of extensive computer simulation, wind tunnel testing and field testing. The process reveals that significant reductions in system costs-of-energy and increases in fatigue lifetime may be expected for VAWT systems using these blade elements. DOE

N85-21129# Technische Hochschule, Darmstadt (West Germany). Fachgebeit Aerodynamik und Messtechnik.
DETERMINATION OF THE DRAG OF FREE FLYING PARTICLES IN SUPERSONIC FLOW WITH A PULSED LASER Thesis [WIDERSTANDSBESTIMMUNG VON FREI FLIEGENDEN PARTIKELN IN UEBERSCHALLSTROEMUNGEN MIT EINEM GEPULSTEN LASER]
A. Bloch 1984 15 p refs In GERMAN
Avail: NTIS HC A02/MF A01

A system to determine the drag of indicator particles used in contactless velocity measurements with lasers was developed. The measuring method and the laser-stroboscope-anemometer are described. The evaluation of the measuring data takes Mach and Reynolds number effects into account, and allows the suitability of particles as indicators for velocity determination to be judged. Author (ESA)

N85-21130# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
NUMERICAL INTEGRATION OF THE UNSTEADY FULL-POTENTIAL EQUATION WITH APPLICATIONS TO TRANSONIC FLOW ABOUT A TWO-DIMENSIONAL AIRFOIL
H. Schippers 3 Dec. 1984 12 p refs Presented at 5th IMACS Intern. Symp. on Computer Methods for Partial Differential Equations, Bethlehem, Penn., 19-21 Jun. 1984
(NLR-MP-84022-U; B8478513) Avail: NTIS HC A02/MF A01

The numerical integration of the unsteady full-potential equation in generalized coordinates in strong conservation form is described for the computation of unsteady transonic flows. Nonlinear truncation errors are minimized by time-linearizing the full-potential equation up to second order accuracy. The resulting second order hyperbolic equation is integrated numerically by the method of fractional steps. A noniterative time-marching procedure is obtained. The full-potential equation is discretized in space by fully conservative finite difference schemes employing mass-flux splitting for the capture of shocks. Numerical results for unsteady transonic flow about a NACA 64A010 airfoil and an ONERA-M6 airfoil are presented. Author (ESA)

N85-21109# Joint Publications Research Service, Arlington, Va.
CURRENT DEVELOPMENT, APPLICATIONS OF AIRSHIPS IN USSR
Yevgeniy Goltsman *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 95-97 Transl. into ENGLISH from Mosk. Pravda (Moscow), 18 Dec. 1984 p 3 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

N85-21423# Joint Publications Research Service, Arlington, Va.
A CALCULATION OF SLENDER DELTA WING WITH LEADING-EDGE SEPARATION BY QUASI-VORTEX-LATTICE METHOD Abstract Only
Shanwen Xiong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 92 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 21-26 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

N85-21424# Joint Publications Research Service, Arlington, Va.
CALCULATION OF THE FLOW AROUND THICK WINGS WITH SEPARATION VORTICES Abstract Only
Peiye Zhu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 93 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 27-33 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

N85-21425# Joint Publications Research Service, Arlington, Va.
THE SPLIT-COEFFICIENT MATRIX METHOD FOR SUPERSONIC THREE DIMENSIONAL FLOW Abstract Only
Lumin Zhang and Xiaonan Shan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 94 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 41-47 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

N85-21426# Joint Publications Research Service, Arlington, Va.
AN EXPERIMENTAL INVESTIGATION OF FLAP TURBULENT HEAT TRANSFER AND PRESSURE CHARACTERISTICS IN HYPERSONIC FLOW Abstract Only
Ruifeng Gao *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 95 Transl. into ENGLISH from Kongqidonglixue Xueabo (China), no. 4, 1984 p 56-60 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-21131# Committee on Science and Technology (U. S. House).
ULTRALIGHT AIRCRAFT TECHNOLOGY AND PUBLIC SAFETY
Washington GPO 1984 159 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 111, 21 May 1984
(GPO-38-948) Avail: Subcommittee on Transportation, Aviation and Materials

Regulations of ultralight aircraft (for safety or other purposes) was nonexistent at first and even now is extremely limited. Pilot licenses are not needed and manufacturers of such aircraft are not required to prove that their products are safe, a factor that has kept costs down and led to enhanced appeal to ultralights. Freedom from regulation is a cause for concern because of numerous accidents, apparently due to lack of pilot training or because of structural inadequacies, but mixing ultralights with other traffic in the national airspace clearly constitutes a hazard. The FAA, for its part, recently promulgated regulations to define what ultralights are and to keep them separated from other traffic. But without licensing, there is no way to assure that pilots know about these restrictions. The industry has made some commendable efforts at self regulation. But these are limited in terms of the number they reach and also because they are voluntary. Whether such efforts are enough or whether some more extensive form of federal regulation is needed is considered. And if so, can this be done without ruining a very popular activity? A.R.H.

N85-21132# Committee on Public Works and Transportation (U. S. House).
LEGISLATION TO IMPROVE AIRLINE SAFETY
Washington GPO 1984 602 p refs Hearings on H. R. 1333, H. R. 2088, H. R. 2142, H. R. 2636, H. R. 3264, H. R. 3793, H. R. 5428, H. R. 5518, and S. 197 before the Subcomm. on Aviation of the Comm. on Public Works and Transportation, 98th Congr., 2nd Sess., 26 Jul. and 1-2 Aug. 1984
(GPO-38-222) Avail: Subcommittee on Aviation

Hearings were conducted and testimony heard concerning legislation to impose standards for aircraft passenger and crew safety. Topic considered are: (1) standard measures of quantity of fresh air per person and overhaul air quality, quantity and quality of humidification, air conditioning limits, emergency breathing equipment, fire extinguishing, smoke and toxic fume removal with safe pressurized limits, and safe pressurization; (2) the deployment and use of on-craft emergency medical equipment and supplies, to include drugs, and their administration by qualified personnel; and (3) the requirement that all commercial aircraft provide high-buoyancy life vests. Various experts were heard and their testimony considered. G.L.C.

N85-21133# Federal Aviation Agency, Atlantic City, N.J.
SUPPRESSION AND CONTROL OF CLASS C CARGO COMPARTMENT FIRES Final Report, Aug. 1983 - Jun. 1984

David R. Blake Feb. 1985 32 p refs
(FAA/CT-84-21) Avail: NTIS HC A03/MF A01

A total of 23 fire tests were conducted in a 2357-cubic foot simulated class C cargo compartment. Various lining materials, fire sources, loading configurations, and smoke detectors were used to determine the ability of class C cargo compartments to control fires. The simulated class C cargo compartment did not successfully control the test fires in all cases. The major conclusion is that the 45 deg bunsen burner test specified in FAR 25.855 does not assure that cargo liners will not burn through when subjected to realistic fires. R.J.F.

N85-21134# National Transportation Safety Board, Washington, D. C. Bureau of Safety Programs.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA: US AIR CARRIER OPERATIONS CALENDAR YEAR 1981
1 Feb. 1985 107 p
(NTSB/ARC-85/01) Avail: NTIS HC A06/MF A01

A record of aviation accidents involving revenue operations of U.S. Air Carriers for calendar year 1981 are presented. Accidents involving commuter air carriers and on demand air taxis are included in this publication. In 1979 and prior years, these accidents were reported in annual reviews of general aviation accidents. Reporting is divided into two sections, according to the federal regulations under which the flight was conducted--14 CFR 121 or 14 CFR 135. For 14 CFR 135 accidents, the reporting is divided further by the type of service provided - scheduled or nonscheduled. In each section, tables are presented to describe the losses and characteristics of 1981 accidents to enable comparison with prior years. Author

N85-21135*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE SAFETY ADVISORY PANEL Annual Report, 1983
Jan. 1984 80 p
(NASA-TM-87428; NAS 1.15:87428) Avail: NTIS HC A05/MF A01 CSCL 13L

An assessment of NASA's safety performance for 1983 affirms that NASA Headquarters and Center management teams continue to hold the safety of manned flight to be their prime concern, and that essential effort and resources are allocated for maintaining safety in all of the development and operational programs. Those conclusions most worthy of NASA management concentration are given along with recommendations for action concerning; product quality and utility; space shuttle main engine; landing gear; logistics and management; orbiter structural loads, landing speed, and pitch control; the shuttle processing contractor; and the safety of flight operations. It appears that much needs to be done before the Space Transportation System can achieve the reliability necessary for safe, high rate, low cost operations. A.R.H.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-21136# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COLLISION AVOIDANCE FOR NAVAL TRAINING AIRCRAFT
John W. Andrews, Raymond R. LaFrey, and Jerry D. Welch 8 Mar. 1985 38 p Sponsored in part by FAA
(Contract F19628-85-C-0002)
(FAA/PM-84-4; ATC-125) Avail: NTIS HC A03/MF A01

The feasibility of using the FAA's Traffic Alert and Collision Avoidance System (TCAS)1 concept is evaluated. The results of a brief study and flight test activity conducted to that end are discussed. The nature of the mid-air collision problem at the Naval Air Training Center is reviewed. This is followed by a brief analysis of a set of documented collisions and near-miss encounters involving aircraft of Navy Training Air Wing 5 at Whiting Naval Air Station in Florida in 1982 and 1983. Experience gained from flight tests of similar encounters is reviewed and applied to the Navy encounter data base. An aircraft equipped with a TCAS Experimental Unit (TEU) was flown to Whiting Field to evaluate the ability of TCAS I equipment to perform reliable surveillance in the naval training environment. Flight test results show that the environment is quite unlike typical civil environments, but that the TCAS surveillance design would be capable of providing a significant degree of protection to Naval trainers. B.W.

N85-21137# Royal Signals and Radar Establishment, Malvern (England).
THE EVOLUTION OF METHODS OF AIR TRAFFIC CONTROL
P. T. Humphrey 1984 14 p
(AD-A149606; RSRE-MEMO-3724; DRIC-BR-93761) Avail: NTIS HC A02/MF A01 CSCL 17/7

This Memo proposes a means whereby ATC methods could evolve to take advantage of developments in civil airline avionics and the opportunity of an ATC air-ground data link. Author (GRA)

N85-21138# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
EVALUATION OF AIR AND GROUND LAUNCHED CRUISE MISSILE NAVIGATIONAL ELEMENT CONTAINERS Final Report, Nov. 1982 - Nov. 1984
A. J. Sicard Nov. 1984 55 p
(AD-A149654; DSTZT-84-R-03) Avail: NTIS HC A04/MF A01 CSCL 16/4

At the request of the Joint Cruise Missile Program Office (JCMPO), Washington, D.C., AFPEA conducted a comparative performance evaluation of cruise missile packaging systems proposed by two subcontractors to provide 15G shock protection to three fragile, navigational instrumentation units. Both packaging systems employed elastomeric shock isolators with different internal platforms and different types of body shells. The containers were tested against a common test plan developed with the concurrence of the contractors and Air Force personnel involved. The objectives of this evaluation were to determine which container design will provide the greatest degree of shock and vibration protection and to develop test data required to resolve questions raised regarding the adequacy of one of the systems in providing protection to the Inertial Navigation Element (INE) under the terms of a warranty program. The results of the tests indicated that the Harding container, proposed by Litton Systems, provided the greatest degree of protection for the Cruise Missile Guidance Set as well as for the Reference Measuring Unit and Computer. Based on these results, the dispute between MDAC and Litton Systems was resolved, thereby enabling JCMPO to expedite actions in procuring the appropriate containers which were essential to the initial deployment of the Air and Ground Launched Cruise Missiles. GRA

N85-21139# Computer Technology Associates, Inc., Englewood, Colo.
OPERATIONS CONCEPT FOR THE ADVANCED AUTOMATION SYSTEM MAN-MACHINE INTERFACE Final Report
M. D. Phillips, K. Tischer, H. A. Ammerman, G. W. Jones, and G. V. Kloster 10 Aug. 1984 565 p
(Contract DT-FA01-83-Y-10554)
(AD-A149797; FAA/AP-84-16) Avail: NTIS HC A24/MF A01 CSCL 09/2

The 'Operations Concept for the AAS Man-Machine Interface' documents a concept for ACF operations, the tasks of the Controller at various types of sectors, his information processing requirements, and the definition of his dialogue with the system. As such, these represent the operational requirements for the Advanced Automation System (AAS) Controller man-machine interface (MMI). These requirements are defined from the Controller's point of view. Controller tasks are described in terms of message inputs, outputs, dialogue requirements, and operational

performance attributes. An assessmment of Controller workload is provided within the framework of human information-processing tasks and associated performance levels by Controller position. The information-processing tasks are considered to include logical (cognitive and perceptual components. These components will of necessity have an impact on the subsequent formation of information coding/presentation requirements, interaction techniques, and high-level dialogue descriptions. The primary objective of this document is to decompose Controller tasks to the level of detail such that the Controller's job is described in terms of: (1) sequences of tasks which respond to a given ATC event; (2) the conceptual dialogue between the Controller and his workstation; (3) interactions with other Controllers, Pilots, Supervisory, and Metering/Flow Control personnel; and (4) information needed by the Controller to successfully execute tasks accurately and in a timely fashion. GRA

N85-21140# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
LANDING CONTROL CENTRALS Final Report
1 Nov. 1984 17 p
(AD-A149800; TOP-6-2-160) Avail: NTIS HC A02/MF A01 CSCL 14/2

This Test Operations Procedure (TOP) describes test methods and techniques for evaluating Landing Control Centrals and their suitability for use in the intended tactical environment. Procedures are included for measuring the antenna patterns of the multiple antenna installation, the communication ranges, and the radar and IFF acquisition ranges. GRA

N85-21141# Naval Postgraduate School, Monterey, Calif.
OPTIMIZATION OF GUIDANCE AND CONTROL USING FUNCTION MINIMIZATION AND NAVSTAR/GPS M.S. Thesis
V. C. Garcia, Jr. Sep. 1984 96 p
(AD-A149956) Avail: NTIS HC A05/MF A01 CSCL 20/2

A carefully designed controller, tuned to minimize a performance criterion based on representation of the added drag due to steering, can minimize propulsion losses. A computer simulation modeling the Sea-Land McLean (SL-7) containership was coupled to a function minimization subroutine and a sea-state generator subroutine to accomplish the tuning. Storing these optimal control parameters in a look up table as functions of ship state, sea state, and encounter angle, this technique can be used as an adaptive controller. Satellite platforms can give continuous environmental operating conditions which may used to select proper controller parameters to provide continuous operation on a minimum of the cost function. The SL-7 containership on a minimum of the cost function. The SL-7 containerhsip computer model was tested in calm waters and in seaway. Originator-supplied keywords include: Optimization, Performance criterion, Nomoto, Taylor's series, Function minimization subroutine, NAVSTAR/GPS, Space transportation system (STS), Sea-Land Mclean. GRA

N85-21142# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
DIRECTION FINDER SET, RADIO Final Report
15 Oct. 1984 22 p
(AD-A149958; TOP-6-2-070) Avail: NTIS HC A02/MF A01 CSCL 17/3

This test operations procedure (TOP) describes general guidance for determining and evaluating the technical performance and technical characteristics of Direction Finder Sets, Radio. A Direction Finder Set consists of three basic elements: a directional antenna, radio receiver, and an indicator. The directional antenna provides a means for locating the wave front since the antenna output varies with the orientation of the antenna relative to the wave front. The radio receiver selects and amplifies the desired signal, and the indicator tells the operator when the plane of the antenna is parallel to the wave front. GRA

N85-21143# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
DYNAMIC WORLD MODELING FOR AN INTELLIGENT MOBILE ROBOT USING A ROTATING ULTRA-SONIC RANGING DEVICE Interim Report
J. L. Crowley Dec. 1984 23 p
(AD-A149979; CMU-RI-TR-84-27) Avail: NTIS HC A02/MF A01 CSCL 17/7

A system which performs task-oriented navigation for an intelligent mobile robot is described in this paper. This navigation system is based on a dynamically maintained model of the local environment, called the Composite Local Model. The Composite Local Model integrates information from a rotating sonar sensor, the robot's touch sensor and a pre-learned Global Model as the robot moves through its environment. Techniques are described for constructing a line segment description of the most recent sensor scan (the Sensor Model) and for integrating such descriptions to build up a model of the immediate environment (the Composite Local Model). Model integration is based on a process of reinforcing the confidence in the consistent information while decaying the confidence in inconsistent information. The estimated position of the robot is corrected by the difference in position between observed sensor signals and the corresponding symbols in the Composite Local Model. This system is useful for navigation in a finite, pre-learned domain such as a house, office, or factory. GRA

N85-21144# Carnegie-Mellon Univ., Pittsburgh, Pa. Lab. for Household Robots.
NAVIGATION FOR AN INTELLIGENT MOBILE ROBOT Interim Report
J. L. Crowley Aug. 1984 20 p Sponsored by Navy
(AD-A150051; CMU-RI-TR-84-18) Avail: NTIS HC A02/MF A01 CSCL 06/4

This paper describes a system which performs task-oriented navigation for an intelligent mobile robot. Global path planning in this system is based on a prelearned model of the robot's domain. The pre-learned model is divided into convex regions using a new maximal-area convex decomposition algorithm. A network of covex region entry-points, called adits, provides the basis for planning a global path as a sequence of straight line movements. This navigation system is based on a dynamically maintained model of the local environment, called the Composite Local Model, which integrates information from different sensors and different views, as well as from the pre-learned model of the robot's domain. Local straight line movements are planned and monitored using this local model. The estimated position of the robot is corrected by the difference in position between observed sensor signals and the corresponding symbols in the local model. This system is useful for navigation in a finite, pre-learned domain as a house, office, or factory. (Author). GRA

N85-21145# Electronic System G.m.b.H., Munich (West Germany).
PROGRAM INNAVSAT: GLOBAL POSITIONING SYSTEM (GPS): TEST AND DEMONSTRATION PROGRAM Final Report, Jan. 1983
Volkmar Held and Johannes Wegscheider Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 113 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-047; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24

A test program for Global Positioning System (GPS) receivers is considered. The requirements of potential user groups were examined, and test environments for land, water, and aircraft were set up. Examples of users are the automobile and offshore industries, airline companies, and the administration. A test program and a receiver specification are under elaboration. Author (ESA)

N85-21146# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Steuerung und Regelung.
ALGORITHMS FOR AUTOMATIC FOUR-DIMENSIONAL AIRCRAFT GUIDANCE, CONSIDERING THE MOMENTARY WIND

SITUATION
Werner Lechner Sep. 1984 101 p refs In GERMAN; ENGLISH summary Original will also be announced as translation (ESA-TT-906)
(DFVLR-FB-84-40; ISSN-0171-1342) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 34

An automatic four dimensional navigation mode covering a terminal maneuvering area was developed and flight tested for the automatic digital flight control system of the HFB 320 test aircraft. Algorithms for the computation of the flight path take into account the current wind situation. Techniques for wind measurement, filtering and prediction were developed. The results of the flight trials are discussed. It is shown that temporal error limits of +or- 5 sec are obtained under the most differing wind situations. The aircraft-oriented wind prediction extrapolation system based Kalman filtering techniques is very efficient. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-21147* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXTENDED MOMENT ARM ANTI-SPIN DEVICE Patent
Raymond D. Whipple, inventor (to NASA) Issued 29 Jan. 1985 8 p Filed 27 Jun. 1983 Supersedes N83-29173 (21 - 18, p 2867)
(NASA-Case-LAR-12979-1; NAS 1.71:LAR-12979-1; US-Patent-4,496,122; US-Patent-Appl-SN-508371; US-Patent-Class-244-75R; US-Patent-Class-244-139; US-Patent-Class-244-147) Avail: US Patent and Trademark Office CSCL 01C

A device which corrects aerodynamic spin is provided in which a collapsible boom extends an aircraft moment arm and an anti-spin parachute force is exerted upon the end of the moment arm to correct intentional or inadvertent aerodynamic spin. This configuration effects spin recovery by means of a parachute whose required diameter decreases as an inverse function of the increasing length of the moment arm. The collapsible boom enables the parachute to avoid the aircraft wake without mechanical assistance, retracts to permit steep takeoff, and permits a parachute to correct spin while minimizing associated aerodynamic, structural and in-flight complications.
Official Gazette of the U.S. Patent and Trademark Office

N85-21148 Department of the Air Force, Washington, D.C.
INTEGRATED PARATROOP DOOR Patent
J. G. Backlund and D. L. Gibler, inventors (to Air Force) Issued 13 Nov. 1984 5 p
(AD-D011507; US-Patent-4,482,113; US-Patent-Appl-SN-586893; US-Patent-Class-586-893) Avail: US Patent and Trademark Office CSCL 13/13

A deployable platform for use in conjunction with an outwardly opening hinged door on the body structure of a vehicle is described. It is comprised of a hydraulically or pneumatically actuated platform pivotally mounted to the vehicle at the doorway opening and connected to the door by an over center linkage member pivotally connected at one end to the door and at the other to the platform whereby the platform may be deployed and releasably locked into place simultaneously with the opening of the door. Author (GRA)

N85-21149*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A LAGRANGE-D'ALEMBERT FORMULATION OF THE EQUATIONS OF MOTION OF A HELICOPTER CARRYING AN EXTERNALLY SUSPENDED LOAD
Jeanine M. Weber and Richard K. Greif Feb. 1985 64 p refs
(NASA-TM-85864; A-9468; NAS 1.15:85864) Avail: NTIS HC A05/MF A01 CSCL 01C

The exact nonlinear equations of motion are derived for a helicopter with an extenal load suspended by fore and aft, rigid-link cables. Lagrange's form of D'Alembert's principle is used. Ten degrees of freedom are necessary to represent the motion of this system in an inertial reference frame: six for the helicopter relative to inertial space and four for the load relative to the helicopter.
Author

N85-21150*# California Univ., Los Angeles. Dept. of Engineering and Applied Science.
ALTERNATIVE APPROXIMATION CONCEPTS FOR SPACE FRAME SYNTHESIS
Robert V. Lust and Lucien A. Schmit Mar. 1985 430 p refs (Grant NsG-1490)
(NASA-CR-172526; NAS 1.26:172526) Avail: NTIS HC A19/MF A01 CSCL 01C

A structural synthesis methodology for the minimum mass design of 3-dimensionall frame-truss structures under multiple static loading conditions and subject to limits on displacements, rotations, stresses, local buckling, and element cross-sectional dimensions is presented. A variety of approximation concept options are employed to yield near optimum designs after no more than 10 structural analyses. Available options include: (A) formulation of the nonlinear mathematcal programming problem in either reciprocal section property (RSP) or cross-sectional dimension (CSD) space; (B) two alternative approximate problem structures in each design space; and (C) three distinct assumptions about element end-force variations. Fixed element, design element linking, and temporary constraint deletion features are also included. The solution of each approximate problem, in either its primal or dual form, is obtained using CONMIN, a feasible directions program. The frame-truss synthesis methodology is implemented in the COMPASS computer program and is used to solve a variety of problems. These problems were chosen so that, in addition to exercising the various approximation concepts options, the results could be compared with previously published work. R.J.F.

N85-21151# Aeronautical Research Labs., Melbourne (Australia).
ON THE APPLICATION OF COMPATIBILITY CHECKING TECHNIQUES TO DYNAMIC FLIGHT TEST DATA
R. A. Feik Jun. 1984 34 p refs
(ARL-AERO-R-161; AR-003-931) Avail: NTIS HC A03/MF A01

Matters related to the application of instrument compatibility checking techniques to flight test data were considered. A previously developed Maximum Likelihood program has been used to study the effects of the presence of scale errors, accelerometer offsets and measurement time lags using simulated data. Some additional information on the effects of noise levels has also been obtained. The results have led to a suggested method for determination of center of gravity location from flight data. The effects of measurement lags have been shown to have a major influence on extracted instrument parameters and a systematic procedure for the determination of relative phases has been devised and applied successfully to simulated data. These techniques have also been applied to flight from a roller coaster maneuver and a set of relative lag values clearly identified. G.L.C.

N85-21152# Aeronautical Research Labs., Melbourne (Australia).
FATIGUE CRACK PROPAGATION IN MIRAGE 1110 WING MAIN SPAR SPECIMENS AND THE EFFECTS OF SPECTRUM TRUNCATION ON LIFE
J. Y. Mann, R. A. Pell, and A. S. Machin Jul. 1984 59 p refs
(ARL-STRUC-R-405; AR-003-937) Avail: NTIS HC A04/MF A01

As part of an investigation into the life extension and safe operation of the wings of the Mirage III0 aircraft, a fatigue testing program and extensive fractographic examination was undertaken on specimens representing the critical section of the spar to assess the effects of truncating the maximum positive loads of the spectrum and provide information relating to fatigue crack propagation rates. Under the fighter type load spectrum adopted, truncation of the maximum load from +7.5g to +6.5g or to +5 g

did not result in an increase in fatigue life, presumably because of the loss of the crack retardation potential of this rarely occurring high positive load. G.L.C.

N85-21153# National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
A HISTORY OF FULL-SCALE TESTING OF AIRCRAFT STRUCTURES AT THE NATIONAL AERONAUTICAL ESTABLISHMENT
R. L. Hewitt Jan. 1985 83 p refs
(NAE-AN-24; NRC-24089) Avail: NTIS HC A05/MF A01

An historical review of the work of the Structures and Materials Laboratory of the National Aeronautical Establishment (NAE) in the area of full scale testing of large aircraft structures is given. The period from 1941 to 1984 is covered, starting with a static strength test of a molded wood Anson fuselage and finishing with a fatigue test of a Grumman Tracker wing. Brief details of the loading arrangements and test results are included for each test component and these are used to trace the development of the laboratory from the use of rulers and shot bags to computer-controlled servo-hydraulic actuators. R.J.F.

N85-21154# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
ANALYTICALLY REDUNDANT OUTPUT FEEDBACK SCHEME FOR REDUCTION OF STRUCTURAL LOADS OF A FLEXIBLE TRANSPORT AIRCRAFT
D. McLean Apr. 1983 91 p refs
(TT-8303) Avail: NTIS HC A05/MF A01

The results of a research investigation into the provision of an analytical redundancy scheme suitable for use with a structural load alleviation control system for a large transport aircraft are presented. The design was based on the use of observer theory and the corresponding self-repairing controller was implemented on a microprocessor. Simulation results are shown to demonstrate the effectiveness of the proposed scheme in maintaining safe and excellent feedback control in the presence of severe and unpredictable failures in motion sensors and feedback control channels. M.G.

N85-21155# Villanova Univ., Pa.
AEROSTRUCTURE NONDESTRUCTIVE EVALUATION BY THERMAL FIELD DETECTION. PHASE 2: TECHNIQUE REFINEMENT AND QUANTITATIVE DETERMINATION OF FLAW DETECTION CAPABILITIES Final Report
P. V. McLaughlin, Jr. and M. G. Mirchandani Lakehurst, N.J. Naval Air Engineering Center 14 Dec. 1984 203 p
(Contract N68335-81-C-5142; F41-460)
(AD-A149622; NAEC-92-181) Avail: NTIS HC A10/MF A01 CSCL 11/4

This report describes the second phase of a program to evaluate and develop methods of flaw detection in laminated fiber composites using infrared radiation detection techniques with application to inspection of aerovehicle structures. Analytical heat transfer studies and experiments were conducted on graphite/epoxy, glass/epoxy and glass/polyester laminates containing simulated delaminations and impact damage. The externally applied thermal field (EATF) technique uses a radiant heater to create hot spots on a composite laminate surface above thermal breaks caused by delaminations and other flaws. The stress-generated thermal field (SGTF) technique requires heat to be generated near flaws by cyclic stressing. GRA

N85-21156# Aeronautical Research Labs., Melbourne (Australia).
DEFLECTION MODEL OF A CT4-A UNDERCARRIAGE
M. Heller and D. G. Ford Jul. 1984 50 p
(AD-A149778; ARL-STRUC-TM-384) Avail: NTIS HC A03/MF A01 CSCL 01/3

In this Australian report, a relationship between applied loads and corresponding bending moment for a CT4-A undercarriage is determined to enable appropriate fatigue test loads to be evaluated. A mathematical model is derived to determine the significant deflection parameters of a loaded CT4-A undercarriage, which is represented as an eccentrically loaded tapered beam mounted at a torsional restraint. A general computer program was written to implement the analysis. Results for the undercarriage were then obtained for a range of loading cases. An empirical equation relating fatigue test loads to bending moment for the undercarriage was fitted. GRA

N85-21157# Advisory Group for Aerospace Research and Development, Paris (France).
TECHNICAL EVALUATION REPORT ON THE FDP SYMPOSIUM ON FLIGHT TEST TECHNIQUES
Frederick N. Stoliker (Computer Sciences Corp., Camarillo, Calif.) Dec. 1984 24 p refs
(AGARD-AR-208; ISBN-92-835-1481-5) Avail: NTIS HC A02/MF A01

The rapidly advancing technologies of integrated flight and fire control, all weather and night attack systems, digital multimode controls, wide field of view head-up displays, system/subsystem simulation, and rapidly increasing instrumentation acquisition, processing, and display capabilities led to the need for this symposium. The papers presented were concerned with three major subject areas: (1) Performance and flying qualities; (2) Systems testing; and (3) Instrumentation and facilities. Information on these topics in flight testing and instrumentation techniques was shared with the AGARD community. E.R.

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-21158# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A SAFETY EVALUATION OF THE RELOCATION OF THE ACM (AIR COMBAT MANEUVER) PANEL IN THE F-14 ( )/AIP (AVIONICS INTEGRATION PROGRAM) Final Report
G. Frisch and K. Miller 14 May 1984 26 p
(AD-A149596; NADC-84076-60) Avail: NTIS HC A03/MF A01 CSCL 01/2

A goal of the F-14 Avionics Integration Program (AIP) is to increase the field-of-view of the pilot's Head-up Display (HUD). One way to accomplish this would be to move the HUD closer to the pilot. However, if this were done, the Air Combat Maneuvering Panel (ACM), which is located on the face of the HUD housing, would either intrude, by approximately 1.25 inches, into the ejection envelope or the ACM panel functions would have to be redistributed throughout the F-14 cockpit. A computer simulation of ejection clearance was performed using a digitized representation of the F-14 cockpit with the relocated HUD. This study was complemented by three live subject ejection tower tests using a foam board representation of the revised ACM panel position. Both the analytical study and the tower tests indicate that the relocation of the ACM panel poses little risk of causing interference during ejection. However, extensive testing, using optimum fidelity seat performance and simulated cockpit structure, would be required to qualify the revised configuration if this option were to be implemented. GRA

N85-21159# CAE Electronics Ltd., Montreal (Quebec).
WIDE-FIELD-OF-VIEW, HELMET-MOUNTED INFINITY DISPLAY SYSTEM DEVELOPMENT Interim Report, Jun. 1981 - Oct. 1983
Dec. 1983 110 p
(Contract F33615-81-C-0012)
(AD-A149641; AFHRL-TR-84-27) Avail: NTIS HC A06/MF A01 CSCL 01/4

This report details the development of a fiber-optic-coupled helmet-mounted display. A working breadboard model has been developed. A computer-generated image projected from a light

valve is relayed to the input of a large format coherent fiber-optic bundle. The fiber-optic bundle transfers the image to a set of helmet-mounted optics which display the imagery via two in-line, wide-angle infinity displays. The helmet position and attitude are sensed and used to control the image content. Studies were also conducted on requirement for eye-slaved control of image content. GRA

N85-21160# Naval Air Test Center, Patuxent River, Md.
PROCEEDINGS OF THE 6TH ADVANCED AIRCREW DISPLAY SYMPOSIUM
16 May 1984 217 p Proc. held at Patuxent River, Md., 15-16 May 1984 Original contains color illustrations
(AD-A150044) Avail: NTIS HC A10/MF A01 CSCL 01/4

The recent proliferation of new color display applications can be traced to two interrelated trends: (1) a growing interest in the potential advantages of a color information display for enhancing human performance in complex man-machine systems; and (2) the availability of a rapidly evolving display technology to support advanced color display concepts. Table of Contents: A Systematic Program for the Development and Evaluation of Airborne Color Display Systems by L. Silverstein, Airborne Electronic Color Displays - A Review of UK Activity Since 1981 by R. Caldow, Color CRT in the F-15 by J. Turner and H. H Waruszewski, Integration of Sensor and Display Subsystems by D. Bohrer and P. Jenkins, Modernizing Engine Displays by E. Schneider and E. Enevoldson, Colored Displays for Combat Aircraft by C. Maureau, Display Technology and the Role of Human Factors by S. Roscoe, J. Tatro, and E. Trujillo, Pictorial Format Program: Past, Present, and Future by G. Lizza, J. Reising, and L. Hitchcock, The Command Flight Path Display - All Weather, All Missions by G. Hoover, S. Shelley, V. Cronauer, and S. Filarsky, Sensor-Coupled Vision Systems by T. Stinnett, An Argument for Standardization in Modern Aircraft Crew Stations by V. Devino. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-21161 Department of the Air Force, Washington, D.C.
FLAMEHOLDER WITH INTEGRATED AIR MIXER Patent
J. L. Kinsey, inventor (to Air Force) Issued 1 Jan. 1985 4 p Supersedes AD-D010228
(AD-D011549; US-Patent-4,490,973; US-Patent-Appl-SN-484329; US-Patent-Class-60-261) Avail: US Patent and Trademark Office CSCL 21/5

A flameholder in an afterburner incorporates an improved mixer which includes a small duct for capturing a small percent of hot gas stream flow and routing the same outwardly along the gutter of the flameholder for producing a localized increase of the air temperature in the cool fan air stream flow. The mixer also includes a deflector plate for deflecting the hot gas exiting from the duct into the cool air stream flow. GRA

N85-21162*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPARISON OF THE EFFICIENCY OF NUMERICAL METHODS FOR INTEGRATING CHEMICAL KINETIC RATE EQUATIONS
Krishnan Radhakrishnan 1984 18 p refs Presented at JANNAF Propulsion Meeting, New Orleans, 7-9 Feb. 1984 Previously announced as N84-31280
(Grant NAG3-147)
(NASA-TM-83590; E-1988; NAS 1.15:83590) Avail: NTIS HC A02/MF A01 CSCL 21E

A comparison of the efficiency of several algorithms recently developed for the efficient numerical integration of stiff ordinary differential equations is presented. The methods examined include two general-purpose codes EPISODE and LSODE and three codes (CHEMEQ, CREK1D, and GCKP84) developed specifically to integrate chemical kinetic rate equations. The codes are applied to two test problems drawn from combustion kinetics. The comparisons show that LSODE is the fastest code currently available for the integration of combustion kinetic rate equations. An important finding is that an iterative solution of the algebraic energy conservation equation to compute the temperature can be more efficient than evaluating the temperature by integrating its time-derivative. Author

N85-21163*# John Deere Technologies International, Inc., Wood-Ridge, N.J. Rotary Engine Div.
STRATIFIED CHARGE ROTARY AIRCRAFT ENGINE TECHNOLOGY ENABLEMENT PROGRAM Final Report
P. R. Badgley, C. E. Irion, and D. M. Myers 31 Jan. 1985 110 p ref
(Contract NAS3-23056)
(NASA-CR-174812; NAS 1.26:174812; JDTI-RED-85-1) Avail: NTIS HC A06/MF A01 CSCL 21E

The multifuel stratified charge rotary engine is discussed. A single rotor, 0.7L/40 cu in displacement, research rig engine was tested. The research rig engine was designed for operation at high speeds and pressures, combustion chamber peak pressure providing margin for speed and load excursions above the design requirement for a high is advanced aircraft engine. It is indicated that the single rotor research rig engine is capable of meeting the established design requirements of 120 kW, 8,000 RPM, 1,379 KPA BMEP. The research rig engine, when fully developed, will be a valuable tool for investigating, advanced and highly advanced technology components, and provide an understanding of the stratified charge rotary engine combustion process. E.A.K.

N85-21164*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION RESEARCH FOR GAS TURBINE ENGINES
Edward J. Mularz and Russell W. Claus 1985 19 p refs To be presented at the 7th Intern. Symp. on Air Breathing Engines, Peking, 2-6 Sep. 1985
(NASA-TM-86963; E-2490; NAS 1.15:86963) Avail: NTIS HC A02/MF A01 CSCL 21E

Research on combustion is being conducted at Lewis Research Center to provide improved analytical models of the complex flow and chemical reaction processes which occur in the combustor of gas turbine engines and other aeropropulsion systems. The objective of the research is to obtain a better understanding of the various physical processes that occur in the gas turbine combustor in order to develop models and numerical codes which can accurately describe these processes. Activities include in-house research projects, university grants, and industry contracts and are classified under the subject areas of advanced numerics, fuel sprays, fluid mixing, and radiation-chemistry. Results are highlighted from several projects. Author

N85-21165*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
ADVANCED STRESS ANALYSIS METHODS APPLICABLE TO TURBINE ENGINE STRUCTURES Final Report
Theodore H. H. Pian Mar. 1985 44 p refs
(Grant NAG3-33)
(NASA-CR-175573; NAS 1.26:175573) Avail: NTIS HC A03/MF A01 CSCL 21E

Advanced stress analysis methods applicable to turbine engine structures are investigated. Constructions of special elements which containing traction-free circular boundaries are investigated. New versions of mixed variational principle and version of hybrid stress elements are formulated. A method is established for suppression of kinematic deformation modes. semiLoof plate and shell elements are constructed by assumed stress hybrid method. An

elastic-plastic analysis is conducted by viscoplasticity theory using the mechanical subelement model. B.W.

N85-21166*# Illinois Univ., Urbana-Champaign.
THE MECHANISMS OF FLAME HOLDING IN THE WAKE OF A BLUFF BODY Final Report
Roger A. Strehlow and Sarmad Malik Mar. 1985 196 p refs
(Contract NAG3-60)
(NASA-CR-3866; NAS 1.26:3866) Avail: NTIS HC A09/MF A01 CSCL 21E

The flame holding mechanism for lean methane- and lean propane-air flames is examined under conditions where the recirculation zone is absent. The main objective of this work is to study the holding process in detail in an attempt to determine the mechanism of flame holding and also the conditions where this mechanism is viable and when it fails and blow-off occurs. Inverted flames held in the wake of a flat strip were studied. Experiments with different sizes of flame holders were performed. The velocity flow field was determined using a laser Doppler velocimetry technique. Equation of continuity was used to calculate the flame temperature from the change in area of flow streamlines before and after the flame. Observations of the inverted flame itself were obtained using schlieren and direct photography. Results show that there are different mechanisms operative at the time of blow-off for lean propane and methane flames. Blow-off or extinction occurs for lean propane-air flame in spite of the reaction going to completion and the disparity between the heat loss and the gain in mass diffusion in the reaction zone i.e., Le $<$ 1.0 causes the flame to blow-off. For methane-air flame the controlling factor or blow-off is incomplete reaction due to higher blowing rate leading to reduced residence time in the reaction zone. M.G.

N85-21167*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
INVESTIGATION OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES Final Report
David G. Lilley Washington NASA Feb. 1985 192 p refs Sponsored in part by AF
(Grant NAG3-74)
(NASA-CR-3869; NAS 1.26:3869) Avail: NTIS HC A09/MF A01 CSCL 21E

Activities undertaken during the entire course of research are summarized. Studies were concerned with experimental and theoretical research on 2-D axisymmetric geometries under low speed nonreacting, turbulent, swirling flow conditions typical of gas turbine and ramjet combustion chambers. They included recirculation zone characterization, time-mean and turbulence simulation in swirling recirculating flow, sudden and gradual expansion flowfields, and furher complexities and parameter influences. The study included the investigation of: a complete range of swirl strengths; swirler performance; downstream contraction nozzle sizes and locations; expansion ratios; and inlet side-wall angles. Their individual and combined effects on the test section flowfield were observed, measured and characterized. Experimental methods included flow visualization (with smoke and neutrally-buoyant helium-filled soap bubbles), five-hole pitot probe time-mean velocity field measurements, and single-, double-, and triple-wire hot-wire anemometry measurements of time-mean velocities, normal and shear Reynolds sresses. Computational methods included development of the STARPIC code from the primitive-variable TEACH computer code, and its use in flowfield prediction and turbulence model development. M.G.

N85-21168*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION GAS PROPERTIES. 2: NATURAL GAS FUEL AND DRY AIR
Jerrold D. Wear, Robert E. Jones, Arthur M. Trout, and Bonnie J. McBride Apr. 1985 12 p refs
(NASA-TP-2435; E-2435; NAS 1.60:2435) Avail: NTIS HC A02/MF A01 CSCL 21E

A series of computations has been made to produce the equilibrium temperature and gas composition for natural gas fuel and dry air. The computed tables and figures provide combustion gas property data for pressures from 0.5 to 50 atmospheres and equivalence ratios from 0 to 2.0. Only samples tables and figures are provided in this report. The complete set of tables and figures is provided on four microfiche films supplied with this report. Author

N85-21169*# National Aeronautics and Space Administration, Washington, D. C.
TOWARDS A RENEWAL OF THE PROPELLER IN AERONAUTICS
D. Berger and P. Jacquet Feb. 1985 32 p Transl. into ENGLISH of Conf. Paper AAF-Paper-NT-82-01 from Assoc. Aeron. et Astron. de France, Marseille, 30 p. Presented at the 19th Colloq. d'Aeron. Appliquee, Marseille Original language doc. was announced in IAA as A83-33159 Transl. by The Corporate Word, Inc., Pittsburgh,
(Contract NAAS-4006)
(NASA-TM-77803; NAS 1.15:77803; AAF-Paper-NT-82-01) Avail: NTIS HC A03/MF A01 CSCL 01A

The reasons for reconsidering the propeller for aircraft propulsion, the areas of application, and necessary developments are considered. Rising fuel costs and an increasing theoretical and experimental data base for turboprop engines have demonstrated that significant cost savings can be realized by the use of propellers. Propellers are well-suited to powering aircraft traveling at speeds up to Mach 0.65. Work is progressing on the development of a 150 seat aircraft which has a cruise speed of Mach 0.8, powered by a turboprop attached to an engine of 15,000 shp. Aeroelasticity analyses ae necessary in order to characterize the behavior of thin profile propfan blades, particularly to predict the oscillations through the entire functional range. High-power reducers must be developed, and the level of cabin noise must be controlled to less than 90 dB. Commercial applications are predicted for turboprops in specific instances. M.S.K. (IAA)

N85-21170# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
AN EXPERIMENTAL INVESTIGATION OF AN UNDER-EXPANDED RECTANGULAR JET EJECTOR Interim Report
Y. Hsia, A. Krothapalli, D. Baganoff, and K. Karamcheti Apr. 1984 123 p
(Contract F49620-79-C-0189)
(AD-A149656; SU-JIAA-TR-53; AFOSR-84-1196TR) Avail: NTIS HC A06/MF A01 CSCL 21/5

An experimental investigation was carried out on a rectangular ejector (constant area mixing duct) with an under-expanded rectangular jet as primary flow. This study investigated the mixing behavior of the ejector flow in general and attempted to identify the effects of the screech tones on the mixing and performance of the ejector. The quantities measured include frequency and amplitude of the screech tone, surface pressure on the ejector duct wall, and the mean flow velocity at the ejector exit in the two central planes of the primary jet. Schlieren flow visualization was made in the plane containing the short dimension of the primary nozzle. The screech tone frequency of the ejector depends not only on the primary jet pressure ratio but also on the ejector duct width. Variations of the screech tone frequency with both the pressure ratio and the duct width show staging behavior. For a given duct width, each screech tone stage matches with one of the transverse modes of the duct. The ejector performance, as determined from the static pressure distribution on the walls, shows irregular variation with pressure ratio, and is found to be related to the screech tone stages. GRA

N85-21171# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 2: Far Infrared.
THE INFLUENCE ON IR EMISSION OF ENGINE PARAMETERS FOR AN AFTERBURN CASE. A SENSITIVITY STUDY ON NATO INFRARED AIR TARGET MODEL (NIRATAM) VERSION: 0.0
J. Baars Oct. 1984 32 p refs
(Contract A82/Klu/081)
(AD-B089311L; PHL-1984-62; TDCK-79703) Avail: NTIS

HC A03/MF A01

The effects of mass flow ratio, exhaust gas temperature, and gas velocity on NATO Infrared Air Target Model calculations of turbojet aircraft plume structure following afterburn were studied. The greatest difference in emission is obtained by changing the concentration of gas species. A smaller effect is produced by variations in exhaust gas temperatures. For variations in the exhaust gas velocities negligible radiation changes are noticed.

Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-21172 Department of the Air Force, Washington, D.C.

TRANSLATING RUDDER PEDAL SYSTEM Patent

G. W. Larson, W. E. Lee, and E. N. Lewis, Jr., inventors (to Air Force) Issued 27 Nov. 1984 6 p Supersedes AD-D009708 (AD-D011510; US-Patent-4,484,722; US-Patent-Appl-SN-393834) Avail: US Patent and Trademark Office CSCL 01/4

A translating rudder pedal system which includes a rudder pedal assembly and a reclinable, translationally moveable, seat operably connected to the pedal assembly, with both the pedal assembly and the seat mounted in a vehicle, such as an aircraft is described. The system ensures that, irrespective of the movement and positioning of the seat, the feet of the user seated in the seat always remain in contact with the control pedals of the rudder pedal assembly. Author (GRA)

N85-21173*# ALPHATECH, Inc., Burlington, Mass.

AUTOMATIC CONTROL DESIGN PROCEDURES FOR RESTRUCTURABLE AIRCRAFT CONTROL Final Report

D. P. Looze, S. Krolewski, J. Weiss, N. Barrett, and J. Eterno Jan. 1985 71 p refs

(Contract NAS1-17411)

(NASA-CR-172489; NAS 1.26:172489; TR-212-1) Avail: NTIS HC A04/MF A01 CSCL 01C

A simple, reliable automatic redesign procedure for restructurable control is discussed. This procedure is based on Linear Quadratic (LQ) design methodologies. It employs a robust control system design for the unfailed aircraft to minimize the effects of failed surfaces and to extend the time available for restructuring the Flight Control System. The procedure uses the LQ design parameters for the unfailed system as a basis for choosing the design parameters of the failed system. This philosophy alloys the engineering trade-offs that were present in the nominal design to the inherited by the restructurable design. In particular, it alloys bandwidth limitations and performance trade-offs to be incorporated in the redesigned system. The procedure also has several other desirable features. It effectively redistributes authority among the available control effectors to maximize the system performance subject to actuator limitations and constraints. It provides a graceful performance degradation as the amount of control authority lessens. When given the parameters of the unfailed aircraft, the automatic redesign procedure reproduces the nominal control system design. B.W.

N85-21174*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ANALYTICAL AND FLIGHT INVESTIGATION OF THE INFLUENCE OF ROTOR AND OTHER HIGH-ORDER DYNAMICS ON HELICOPTER FLIGHT-CONTROL SYSTEM BANDWIDTH

Robert T. N. Chen and William S. Hindson (Stanford Univ., Calif.) Feb. 1985 20 p refs Presented at 1st Ann. Forum of the Intern. Conf. on Basic Rotorcraft Res., Research Triangle Park, N. C., 19-21 Feb. 1985

(NASA-TM-86696; A-85153; NAS 1.15:86696) Avail: NTIS HC A02/MF A01 CSCL 01C

The increasing use of highly augmented digital flight-control systems in modern military helicopters prompted an examination of the influence of rotor dynamics and other high-order dynamics on control-system performance. A study was conducted at NASA Ames Research Center to correlate theoretical predictions of feedback gain limits in the roll axis with experimental test data obtained from a variable-stability research helicopter. Feedback gains, the break frequency of the presampling sensor filter, and the computational frame time of the flight computer were systematically varied. The results, which showed excellent theoretical and experimental correlation, indicate that the rotor-dynamics, sensor-filter, and digital-data processing delays can severely limit the usable values of the roll-rate and roll-attitude feedback gains.

R.J.F.

N85-21175# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.

SOME ASPECTS OF THE DESIGN OF A FLY-BY-WIRE FLYING CONTROL SYSTEM FOR A SUPERSONIC V/STOL FIGHTER AIRCRAFT

J. P. Fielding and X. Z. Meng Mar. 1984 68 p refs

(Coll-Aeron-8413) Avail: NTIS HC A03/MF A01

Results of a student group project to design the flight control system of a supersonic vertical takeoff fighter aircraft are summarized. The original design is evaluated in terms of safety, mission reliability, and maintenance reliablity. Subsequent work concentrated on the investigation of the rudder pedal control systems in the cockpit with detailed design of the preferred scheme. The final phase of work concerned the design of the roll reaction control nozzle. The system evaluation showed the vital importance of adequate reliability calculations early in the design process. It also gave a good insight into how the system really works and how it might fail. M.G.

N85-21176*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.

OPTIMAL SYMMETRIC FLIGHT STUDIES Interim Report

A. R. Weston, P. K. A. Menon, K. D. Bilimoria, E. M. Cliff, and H. J. Kelley Feb. 1985 227 p refs

(Grant NAG1-203)

(NASA-CR-172508; NAS 1.26:172508) Avail: NTIS HC A11/MF A01 CSCL 01C

Several topics in optimal symmetric flight of airbreathing vehicles are examined. In one study, an approximation scheme designed for onboard real-time energy management of climb-dash is developed and calculations for a high-performance aircraft presented. In another, a vehicle model intermediate in complexity between energy and point-mass models is explored and some quirks in optimal flight characteristics peculiar to the model uncovered. In yet another study, energy-modelling procedures are re-examined with a view to stretching the range of validity of zeroth-order approximation by special choice of state variables. In a final study, time-fuel tradeoffs in cruise-dash are examined for the consequences of nonconvexities appearing in the classical steady cruise-dash model. Two appendices provide retrospective looks at two early publications on energy modelling and related optimal control theory. Author

N85-21177# Systems Control Technology, Inc., Dayton, Ohio.

INTEGRATED CONTROL SYSTEM ENGINEERING SUPPORT Final Report, Sep. 1979 - Apr. 1984

W. H. Clark, R. L. Braet, R. H. Smith, R. E. Bailey, and T. P. Barry Dec. 1984 212 p

(Contract F33615-79-C-3614)

(AD-A149742; AFWAL-TR-84-3068) Avail: NTIS HC A10/MF A01 CSCL 01/3

This report covers development, test, integration and documentation of software and specialized interfaces for use in the Flight Control Development Laboratory (AFWAL/FIGX); analysis of redundancy management for a multi-channel Flight Control System in the Digital Synthesis Flight Engineering Facility; support for the advanced development programs through analysis of multi-channel Flight Control Systems and the independent assessment of prime contractors efforts in the areas of control law development and

coding; and software development for these and other programs on PD-11, AN/AYK-15, ROLM, and EAI machines and other equipment. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-21178* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTINUOUS LAMINAR SMOKE GENERATOR Patent
Leonard M. Weinstein, inventor (to NASA) Issued 15 Jan. 1985 7 p Filed 30 Aug. 1983 Supersedes N83-35158 (21 - 23, p 3772)
(NASA-Case-LAR-13014-1; NAS 1.71:LAR-13014-1; US-Patent-4,493,211; US-Patent-Appl-SN-527918; US-Patent-Class-73-147) Avail: US Patent and Trademark Office CSCL 14B

A smoke generator capable of emitting a very thin, laminar stream of smoke for use in high detail flow visualization was invented. The generator is capable of emitting a larger but less stable rope of smoke. The invention consists of a pressure supply and fluid supply which supply smoke generating fluid to feed. The feed tube is directly heated by electrical resistance from current supplied by power supply and regulated by a constant temperature controller. A smoke exit hole is drilled in the wall of feed tube. Because feed tube is heated both before and past exit hole, no condensation of smoke generating occurs at the smoke exit hole, enabling the production of a very stable smoke filament. The generator is small in size which avoids wind turbulence in front of the test model.

Official Gazette of the U.S. Patent and Trademark Office

N85-21179# New Mexico Univ., Albuquerque. Engineering Research Inst.
RUNWAY RUBBER REMOVAL SPECIFICATION DEVELOPMENT FIELD EVALUATION PROCEDURES DEVELOPMENT
R. Gordon McKeen, Lary R. Lenke, and Richard A. Graul Washington, D.C. FAA Jul. 1984 134 p refs Sponsored in part by Air Force
(FAA-PM-84-27; ESL-TR-84-40) Avail: NTIS HC A07/MF A01

The phenomenon of runway touchdown zone rubber buildup is a potentially hazardous problem. Rubber buildup covers the runway surface and occludes the surface texture. This results in reduced wet friction coefficient between the runway pavement and the aircraft tires. Methods and equipment are available for evaluating the wet friction coefficient; however, these methods are expensive and require highly trained personnel. Therefore, most airport and airbase managers rely exclusively on visual impressions on rubber buildup in lieu of quantitative measurements. Nonetheless, quantitative evaluation techniques are desireable for evaluating rubber buildup. An extensive literature review suggests that pavement surface texture measurement techniques may be indicative of rubber buildup and resultant reduction in wet friction coefficient. Rubber buildup alters the texture properties of a runway as well as the frictional coefficient. A suggested field evaluation experiment is described to ascertain which of five selected texture measurement techniques are indicative of reduced friction values in pavement areas with rubber buildup. Author

N85-21180# Clemson Univ., S.C. Dept. of Civil Engineering.
FIELD VALIDATION OF STATISTICALLY-BASED ACCEPTANCE PLAN FOR BITUMINOUS AIRPORT PAVEMENTS. VOLUME 1: CORRELATION ANALYSIS OF MARSHALL PROPERTIES OF LABORATORY-COMPACTED SPECIMENS Final Report
James L. Burati, Jr., Gary D. Brantley, and Frederick W. Morgan May 1984 133 p refs
(Contract DTFA01-81-C-10057)
(FAA/PM-84-12-Vol-1) Avail: NTIS HC A07/MF A01

The laboratory phase of a three phase research effort conducted to field validate a multiple price adjustment system for bituminous airport pavements using the Marshall properties, stability, flow and air voids, is presented. The purpose of the laboratory phase was to identify whether correlations exist among the Marshall properties within individual tests. To consider the use of these properties in a multiple price adjustment system, it was first necessary to identify these correlations. The experimental design consisted of 4 different aggregate gradations and 6 different asphalt contents for a total of 24 combinations. A total of 12 replicates were tested for each combination for a total of 288 Marshall test specimens. A number of statistical analyses were conducted on the laboratory test results. An analysis of variance was conducted to determine whether time, i.e., order of testing, had an effect on the results. Correlation coefficients among the Marshall properties, i.e., stability with flow, stability with air voids and flow with air voids, were calculated for each of the 24 combinations. The results of the analysis indicate correlations that are consistent enough to violate an assumption of statistical independence among the properties. R.J.F.

N85-21181# Clemson Univ., S.C. Dept. of Civil Engineering.
FIELD VALIDATION OF STATISTICALLY-BASED ACCEPTANCE PLAN FOR BITUMINOUS AIRPORT PAVEMENTS. VOLUME 2: STATISTICAL ANALYSIS OF MARSHALL PROPERTIES OF PLANT-PRODUCED BITUMINOUS MATERIALS Final Report
James L. Burati, Jr., James D. Seward, Jr., and Herbert W. Busching May 1984 70 p refs
(Contract DTFA01-81-C-10057)
(FAA/PM-84-12-Vol-2) Avail: NTIS HC A04/MF A01

Two aspects concerning evaluation by the Marshall method of bituminous airport pavement construction were addressed. Results from field Marshall and extraction tests were analyzed to identify correlations among the Marshall properties - stability, flow, and air voids - and asphalt content and aggregate gradation. This was done to evaluate the implementation of a multiple price adjustment system based on Marshall properties, and for the development of mathematical models for estimating each property from the percent asphalt content and aggregate gradation. Data were obtained from 5 airport paving projects; however, two of these had such small tonnages that there were not sufficient data to prove meaningful. A moderately low negative correlation exists between stability and air voids, while no statistically significant correlation was found to exist between stability and flow. The flow and air voids correlations were not consistent among the two projects considered, with one suggesting a moderately low negative correlation, and the other no statistically significant one. The mathematical models developed for stability, flow, and air voids from extracted asphalt content and aggregate gradation were not good predictors of those properties. R.J.F.

N85-21182# Clemson Univ., S.C. Dept. of Civil Engineering.
FIELD VALIDATION OF STATISTICALLY-BASED ACCEPTANCE PLAN FOR BITUMINOUS AIRPORT PAVEMENTS. VOLUME 3: STATISTICAL ANALYSIS OF 3 METHODS FOR DETERMINING MAXIMUM SPECIFIC GRAVITY OF BITUMINOUS CONCRETE MIXTURES Final Report
James L Burati, Jr. and James D. Seward, Jr. May 1984 86 p refs
(Contract DTFA01-81-C-10057)
(FAA/PM-84-12-Vol-3) Avail: NTIS HC A05/MF A01

Five replicates of asphaltic concrete at five alphalt contents were produced and tested to compare maximum specific gravities determined by individual constituents, by solvent immersion, and by American Society for Testing and Materials (ASTM) D-2041. The effects of variations in asphalt content on the maximum specific gravities obtained by the three methods were also considered. A statistically significant difference was found to exist between the solvent immersion and ASTM D-2041 methods at all five asphalt contents; whereas, no significant difference was found

between the solvent immersion and individual constituents methods. There was a significant difference between the ASTM D-2041 method and individual constituents methods. This difference varies with asphalt content. Since the solvent immersion and ASTM D-2041 methods provide statistically different results, it is not appropriate to allow the use of both methods in the same specification unless separate acceptance limits are used. It is recommended that the solvent immersion method be eliminated from use since the ASTM D-2041 procedures are much more commonly used. To avoid the use of a correction factor to convert the ASTM D-2041 values to equivalent individual constituents, as is currently done, it is recommended that the maximum specific gravity for job mix formula determination be established by the ASTM D-2041 method. Author

N85-21183# Clemson Univ., S.C. Dept. of Civil Engineering.
FIELD VALIDATION OF STATISTICALLY-BASED ACCEPTANCE PLAN FOR BITUMINOUS AIRPORT PAVEMENTS. VOLUME 4: COMPUTER SIMULATION OF MULTIPLE ACCEPTANCE CRITERIA Final Report
Soronadi Nnaji, James L. Burati, Jr., and M. G. Tarakji Aug. 1984 105 p refs
(Contract DTFA01-891-C10057)
(FAA/PM-84-12-Vol-4) Avail: NTIS HC A06/MF A01

The procedures and results of a computer simulation analysis conducted to investigate the performance of 7 methods for determining the payment factor for a lot of materials when 3 correlated acceptance properties, i.e., the Marshall stability, flow and air voids, are used for acceptance purposes are given. The methods investigated were based upon triple numerical integration of the three property values and using the smallest individual property value. Marshall test results from 15 runway paving projects were analyzed to determine mean, variance and correlation values obtained in field construction. Computer simulation was used to investigate the performance of the various methods for determining the payment factor for multiple acceptance properties. It is recommended that the average of the three payment factors for the individual Marshall properties be determined using the quality index approach currently employed by the FAA Eastern Region for density acceptance purposes. The payment factor for the Marshall properties can then be calculated as the average of the 3 individual property payment factors. R.J.F.

N85-21184# Clemson Univ., S.C. Dept. of Civil Engineering.
FIELD VALIDATION OF STATISTICALLY-BASED ACCEPTANCE PLAN FOR BITUMINOUS AIRPORT PAVEMENTS. VOLUME 5: SUMMARY OF VALIDATION STUDIES Final Report
James L. Burati, Jr., Herbert W. Busching, and Soronadi Nnaji Sep. 1984 48 p refs
(Contract DTFA01-81-C10057)
(FAA/PM-84-12-Vol-5) Avail: NTIS HC A03/MF A01

A research project that was conducted to investigate the use of Marshall properties for acceptance purposes is summarized. Since the Marshall properties are physically related, they can be expected to be statistically correlated. It is therefore necessary to determine whether correlations exist among the properties, and how such correlations should be considered when developing acceptance plans. The research consisted of three major phases; a laboratory analysis, field data collection and computer simulation analyses. A laboratory analysis was conducted to establish whether correlations are present among asphalt content, gradation, and the Marshall values for stability, flow and air voids. Another aspect of the laboratory analysis investigated three methods for determining maximum specific gravity for air voids determination. Field data were also collected from five paving projects. Finally, computer simulation was used to evaluate the performance of seven methods for determining the payment factor for the Marshall properties. R.J.F.

N85-21185# Pacific Northwest Lab., Richland, Wash.
EXAMINATION OF THE FEASIBILITY FOR DEMONSTRATION AND USE OF RADIOLUMINESCENT LIGHTS FOR ALASKAN REMOTE RUNWAY LIGHTING Final Report
G. Jensen, L. Perrigo, L. Leonard, and L. Hegdal Jan. 1984 237 p refs
(Contracts DE-AC06-76RL-01830; DE-SC06-83RL-10312)
(DE85-002503; PNL-5183) Avail: NTIS HC A11/MF A01

The use of radioluminescent (RL) lights to assist night landings of aircraft is a potentially valuable alternative to fireports or similar nonconventional lighting at many rural airports throughout Alaska. While RL airport illuminators are not yet available commercially, successful demonstrations suggest that a prototype design has been refined to a point where technology transfer to industry may be made in the near future. Preliminary cost estimates suggest that significant cost advantages could be possible for applications in rural Alaska compared to conventional lighting systems. Since the RL lights contain radiactive materials, there is some potential risk that their use will result in exposure to radiation doses to humans who come into contact with them. Under worst-case accident scenarios, it is possible that a significant dose greater than 5.0 rem could be received by a limited number of people. DOE

N85-21107# Joint Publications Research Service, Arlington, Va.
NEW FLIGHT SIMULATORS AT VNUKOVO PERMIT LESS IN-FLIGHT TRAINING
M. Blinov and V. Gurdzhiyants *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 5-7 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 15 Jan. 1985 p 3 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

N85-21108# Joint Publications Research Service, Arlington, Va.
NEW RUNWAY ENABLES IL-76 FLIGHTS TO TENKELI IN FAR NORTH
O. Borodin *In its* USSR Rept.: Transportation (JPRS-UTR-85-004) 27 Feb. 1985 p 8-9 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 8 Jan. 1985 p 1 (For primary document see N85-21105 12-01)
Avail: NTIS HC A06

N85-21465# Army Missile Lab., Redstone Arsenal, Ala.
DEVELOPMENT OF A HIGH TEMPERATURE SINGLE IMPACT RAIN EROSION TEST CAPABILITY
K. N. Letson and S. P. Risner *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 195-206 (For primary document see N85-21444 12-32)
(AD-P004371) Avail: NTIS HC A12/MF A01 CSCL 17/9

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-21186*# Bjorksten Research Labs., Inc., Madison, Wis.
DEVELOPMENT OF THE SONIC PUMP LEVITATOR Final Contractor Report
Stanley A. Dunn 28 Feb. 1985 110 p refs
(Contract NAS8-33513)
(NASA-CR-171382; NAS 1.26:171382) Avail: NTIS HC A06/MF A01 CSCL 22A

The process and mechanism involved in producing glass microballoons (GMBs) of acceptable quality for laser triggered inertial fusion through use of glass jet levitation and manipulation are considered. The gas jet levitation device, called sonic pumps, provides positioning by timely and appropriate application of gas mementum from one or more of six sonic pumps which are arranged orthogonally in opposed pairs about the levitation region and are activated by an electrooptical, computer controlled, feedback system. The levitation device was fabricated and its associated control systems were assembled into a package and tested in reduced gravity flight regime of the NASA KC-135 aircraft. A.R.H.

N85-21187*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MONODISPERSE LATEX REACTOR (MLR): A MATERIALS PROCESSING SPACE SHUTTLE MID-DECK PAYLOAD
Dale M. Kornfeld Jan. 1985 16 p refs
(NASA-TM-86487; NAS 1.15:86487) Avail: NTIS HC A02/MF A01 CSCL 22A

The monodisperse latex reactor experiment has flown five times on the space shuttle, with three more flights currently planned. The objectives of this project is to manufacture, in the microgravity environment of space, large particle-size monodisperse polystyrene latexes in particle sizes larger and more uniform than can be manufactured on Earth. Historically it has been extremely difficult, if not impossible to manufacture in quantity very high quality monodisperse latexes on Earth in particle sizes much above several micrometers in diameter due to buoyancy and sedimentation problems during the polymerization reaction. However the MLR project has succeeded in manufacturing in microgravity monodisperse latex particles as large as 30 micrometers in diameter with a standard deviation of 1.4 percent. It is expected that 100 micrometer particles will have been produced by the completion of the the three remaining flights. These tiny, highly uniform latex microspheres have become the first material to be commercially marketed that was manufactured in space. Author

N85-21188*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITAL DEBRIS
Donald J. Kessler, comp. and Shin-Yi Su, comp. (Lockheed-EMSCO, Houston, Tex.) Mar. 1985 453 p refs Proc. of a Workshop held in Houston, Tex., 27-29 Jul. 1982
(NASA-CP-2360; S-532; NAS 1.55:2360) Avail: NTIS HC A20/MF A01 CSCL 22A

Earth orbital debris issues and recommended future activities are discussed. The workshop addressed the areas of environment definition, hazards to spacecraft, and space object management. It concluded that orbital debris is a potential problem for future space operations. However, before recommending any major efforts to control the environment, more data are required. The most significant required data are on the population of debris smaller than 4 cm in diameter. New damage criteria are also required. When these data are obtained, they can be combined with hypervelocity data to evaluate the hazards to future spacecraft. After these hazards are understood, then techniques to control the environment can be evaluated. For individual titles, see N85-21189 through N85-21224.

N85-21189*# North American Air Defense Command, Peterson AFB, Colo.
NORAD OPERATIONAL SYSTEM
David Brach *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 22-29 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

There are three aspects to the Space Defense Mission: satellite surveillance, satellite protection and satellite negation. The focus of this report is on space surveillance and detection as currently accomplished by both ground and space based assets. The evolution of the space surveillance system is described. The characteristics of the current space surveillance system are also described. B.W.

N85-21190*# North American Air Defense Command, Peterson AFB, Colo.
HISTORY OF SATELLITE BREAK-UPS IN SPACE c15
John Gabbard *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 30-38 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

By 28 June 1961 the 1st Aerospace Control Squadron had cataloged 115 Earth orbiting satellites from data supplied by a rather diverse collection of radar and optical sensors. On 29 June 1961, the Able Star rocket of the 1961 Omicron launch exploded causing a quantum jump in the number of Earth orbiting objects. Since that time there have been 69 Earth orbiting satellites break up in space whose debris remained in orbit long enough for orbital elements to be developed. A list of the 69 breakups is provided. The debris from some of the lower altitude breakups has all decayed. Among the 69 breakups, 44 have cataloged debris remaining in orbit. As of 1 July 1982, the size of the cataloged orbiting population was exactly 4700. Forty-nine percent of these objects are fragments of the forty-four breakups. For each breakup the various orbits of its debris represent a family of orbits that are related in characteristics due to their common impulse launch. A few examples are shown of how the families are oriented in space. B.W.

N85-21191*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NORAD'S PARCS SMALL SATELLITE TESTS (1976 AND 1978) c15
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 39-44 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

NORAD sponsored small satellite tests in 1976 and 1978. The purpose of the tests was to use their more sensitive radar to determine the number of Earth orbiting objects which are not part of the official catalogue. Both tests used the PARCS radar. The characteristics of this radar are given. The detection capability of NORAD's operational system is estimated and compared to the PARC's radar sensitivity during these tests. The tests only slightly improved the detection capability, and the largest improvements were at the lowest and highest regions of its sensitivity range. The major conclusion of the test is that 17.7% of the objects detected were uncorrelated (i.e., not in the official catalogue). However, perhaps most significant is the altitutde and size distribution of detected objects are illustrated. The 1978 results are also summarized. This test concluded that at least 7% of the objects detected were not in the official catalogue. Another 6% of the detected objects were not tracked well enough to determine their status. Again, a large percentage of the detected objects at lower altitudes were not in the catalogue. B.W.

N85-21192*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MANMADE ORBITAL DEBRIS STUDIES AT NASA LANGLEY
Donald H. Humes, David R. Brooks, Jose M. Alvarez, and T. Dale Bess *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 45-68 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

In the past, flight experiments to define the meteoroid environment near the Earth and in interplanetary space were undertaken. The effectiveness of meteoroid bumpers was investigated. These flight experiments were aboard Pioneer 10, Pioneer 11, and Explorer 46. Hypervelocity impact tests were conducted in the laboratory to study protective structures and the composition of meteoroids from the hundreds of meteor spectra obtained. It was also found that manmade debris presented a similar hazard to spacecraft near the Earth. An assessment of that hazard is made in this paper. An analysis of the collision probability problem with much attention given to the population of small untrackable fragments created during explosions is presented. B.W.

N85-21193*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NASA/JSC ORBITAL DEBRIS STUDY: DEBRIS MODEL
J. Brad Roberts, Donald J. Kessler, and Shin-Yi Su *In its* Orbital Debris Mar. 1985 p 69-77 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The possibility of the creation of a debris belt around the Earth is discussed. A computer model which describes the near-Earth space environment created by the existing spacecraft and fragments from the associated spent launching vehicle attachments and explosions was developed. The present debris model adopts the mathematical formulations published in a paper by Kessler. Thus, the model uses more rigorous mathematical

formulation in calculating the collision rate between two orbiting objects than the one published by Kessler and Cour-Palais (1978). The present model contains many general but detailed analyses on the debris environment such as manipulating and/or sorting the existing debris objects, the physical dimensions of the objects and extrapolating the number density describing to include the unobservable small objects. B.W.

N85-21194*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROPOSED PRELIMINARY DESIGN CRITERIA MODEL ENVIRONMENT FOR THE 1990'S
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 78-83 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

An environment must first be defined before the effects of that environment can be evaluated. The environment may later prove to be either more severe or less severe, and consequently the effects will also become either more severe or less severe. Thus, the original environment can also serve as a reference point for future updates. A model environment for orbital debris is proposed. It is recognized that much more is unknown about the environment than is known, and any model at best represents an educated guess based on a limited amount of data. The major assumptions in the proposed model environment and the uncertainty in those assumptions are discussed. B.W.

N85-21195*# Aerospace Corp., El Segundo, Calif.
ASSESSMENT OF SATELLITE COLLISION HAZARDS BY SIMULATED SAMPLING IN SPACE
V. A. Chobotov *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 84-101 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The origin and distribution of the tracked population of objects and implications for future missions were examined. The distribution of the tracked population of objects as a function of altitude and orbital inclination are studied. Representative encounter parameters such as the number, relative velocity, and miss distance are determined for circular mission orbits and are used to classify regions of space according to the degree of collision hazard presented. Implications for space shuttle and geosynchronous orbits are examined. E.A.K.

N85-21196*# Battelle Columbus Labs., Ohio.
A MODEL FOR THE EVOLUTION OF ON-ORBIT MANMADE DEBRIS ENVIRONMENT
Robert C. Reynolds, Norman H. Fischer, and Donald S. Edgecombe *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 102-132 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

Man-made debris in low-Earth orbit (LEO) and the conduct of operations/procedures which leave debris in orbit are discussed. With continued deposition and larger vehicles and longer times on orbit for LEO operations, the probability of collisions between such vehicles and some member of the debris population becomes large. Because the collisions will occur at very large relative speeds, a small object which would not normally be considered a hazard might pose a lethal threat to an operating spacecraft. Future debris states must be deduced from an evaluation of many models using a Monte Carlo method for future deposition events. A model for the population evolution is presented and results of model calculations are discussed. Contributions to the population which may be expected to arise from on-orbit collisions and explosions are examined. Results are presented as models for future space usage as an extrapolation of usage in the past, for an era of enhanced space usage, and for an era in which antisatellite tests provide a debris contribution. E.A.K.

N85-21197*# Air Force Satellite Control Facility, Sunnyvale, Calif.
GEOSYNCHRONOUS SATELLITE COLLISION AVOIDANCE Abstract Only
William Fraser *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 133 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The increases in the number of satellite systems, the growing dependency on these systems, and the potentially hazardous conjunctions in space, dictates careful management of satellite positions. The potential for satellite collision increases as more objects are placed in orbit. At geosynchronous altitudes active satellites maintain fixed longitudinal station-keeping control while inactive satellites and debris generally drift around the globe or oscillate about two geopotential stable points. Portions of the total objects in geosynchronous orbit are tracked by ground stations while a significant number of additional pieces of space debris regularly pass through geosynchronous orbit altitudes. The probability of an operational satellite colliding with another satellite or a piece of space debris will increase in the number of space objects, their sizes, and on-orbit lifetimes. E.A.K.

N85-21198*# General Electric Co., Fairfield, Conn.
IN SITU ORBITAL DEBRIS EXPERIMENT CONCEPTS
Sherman L. Neste *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 134-149 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

Implementation of the radar, lidar and passive optical remote sensing concepts for measuring space debris from an Earth orbiting platform was investigated. Each system was compared for their requirements on the host platform, their performance relative to the space debris measurement program and the estimated cost of developing each concept into a flight instrument. It is found that the radar and lidar systems offer the greatest versatility and accuracy since they control the direction, intensity and duration of the energy incident on the target object. The performance of the passive optical system is determined by the capability of the detector and by the baseline separation of the telescopes, which requires the use of an on-orbit deployment mechanism. The passive optical concept provides the largest total event rae, and includes significant detections of particle sizes greater than 10 cm to allow correlation with ground based observations of the larger particles. The event rate for the radar system is relatively constant with particle while the lidar system is slightly biased toward the smaller sizes. These event rate differences result from a combination of the debris flux size distribution and the variation of sensitive detection area with particle size for the three concepts. E.A.K.

N85-21199*# Southwestern Univ., Georgetown, Tex.
PRELIMINARY DESIGN OF AN EARTH-BASED DEBRIS DETECTION SYSTEM USING CURRENT TECHNOLOGY AND EXISTING INSTALLATIONS
T. H. Morgan *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 150-163 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

Assessment of debris hazard requires the determination of debris down to mm sizes for near-Earth orbits and near-stationary points. It is necessary to obtain reasonable orbits for a statistically significant sample of the debris population. Several ground-based techniques for detection are available. Radar detection was used to obtain information of existing debris population. Another technique is optical detection. The possibilities and application of optical detection with state-of-the-art instrumentation is studied. E.A.K.

N85-21200*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USE OF GROUND RADAR TO DETECT REENTERING DEBRIS c32
Jeanne Lee Crews *In its* Orbital Debris Mar. 1985 p 164-169 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 17I

The velocity of the particles is required to identify the type of particles producing the ionization trails. A method of approximating the velocity of a meteor from radar data was developed. The

method requires the time between the spacings of the Fresnel interference fringes, the range to the ionization trail, and the wavelength of the radar system. The orbital mechanics of the problem are evaluated, if the particles originate with the shuttle, the orbital mechanics will substantiate the relative position of the particles with the position of the shuttle. A program to determine spacecraft orbital decay due to perturbations is utilized for a preliminary evaluation of the orbital mechanics of the problem. Many assumptions concerning the size, shape, density, etc. of the particles are necessary for the preliminary evaluation. The results do not negate the possibility that the events observed by the radar are reentering particles originating from the shuttle.
E.A.K.

N85-21201*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PARTICLE SIZE, NUMBER, COMPOSITION AND VELOCITY FROM SOLID ROCKET MOTORS c20
Barney B. Roberts *In its* Orbital Debris Mar. 1985 p 170-176 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 21H

The damage potentials to the space shuttle orbiter caused by the high velocity particles contained in the exhaust plume of an upper stage is discussed. In particular, the particle size distribution and composition, the velocity of the particles and the expected contribution from shuttle launched upper stages are addressed. Particle size estimates based on historical data are compapred with those derived from upper stage motor performance testing. The particle velocities as determined by the best available plume computational technique are presented. The shuttle is scheduled to launch approximately 135 upper-stages over its lifetime looking at the currently scheduled flights and averaging over a yearly basis yields the contribution of particulates from the uper-stages. On the average, 91,645 lbs of Al2O3 will be ejected on each launch. The analysis to determine how much of this 91,645 lbs will remain in orbit or the decay rate is yet to be accomplished.
M.G.

N85-21202*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HYPERVELOCITY IMPACTS ON SKYLAB 4/APOLLO WINDOWS c18
Uel S. Clanton, Herbert A. Zook, and Richard A. Schultz (Lunar and Planetary Inst.) *In its* Orbital Debris Mar. 1985 p 177-189 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The three largest Skylab 4 Command Module windows that were exposed for 84 days to space were optically scanned for impact features as small as 30 microns in diameter. This scanning effort which was carried out at an opptical magnification of 35x, detected features approximately three times smaller than were found in the original 5x scanning effort over the entire window surface. Some 289 features were recorded from the 35x scan for later detailed analyses. Sixty of the largest and most promising features were cored from the windows for SEM and energy-dispersive X-ray spectrometer (EDS) analysis. Twenty-six of the cores contained craters with glassy pits, and of these, fourteen were found to contain strikingly obvious liners coating the interior of the glassy pit. The six largest features cored from the windows do not have a central glassy pit which leaves their previously reported hypervelocity origin in some doubt. The remaining twenty-eight features that were cored from the windows show no clear evidence for a hypervelocity origin and evidence available at this time is insufficient to identify an origin in Earth orbit or as ground damage. The EDS analysis of six of the seven liners that were examined show detectable aluminum in the liner or lip of the glassy pit. The source of aluminum is most probably an Earth orbiting population of aluminum oxide spherules, exhaust from solid rocket motors.
M.G.

N85-21203*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SURVEY OF PROBABLE MICROMETER-SIZED EARTH-ORBITAL DEBRIS FRAGMENTS IN THE NASA-JSC COSMIC DUST SAMPLE COLLECTION
Uel S. Clanton and J. L. Gooding *In its* Orbital Debris Mar. 1985 p 190-219 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

A program to collect extraterrestrial dust samples from the stratosphere using impactors mounted on NASA U-2 and WB-57F aircraft is discussed. Sample collection, preparation, and analysis techniques are described and the particle types found are reviewed. Preliminary examination of the particles indicates that they represent not only extraterrestrial material, but some fraction of terrestrial contamination from both natural and manmade sources. This examination involves a combination of optical microscopy, scanning electron microscopy (SEM) and qualitative bulk elemental analysis using an energy-dispersive X-ray spectrometer (EDS) to characterize each particle. The cosmic dust collection contains samples of at least three classes of material that may present some hazard to extended spacecraft operations in near-Earth orbit: (1) micrometeorites/cosmic dust, (2) aluminum oxide spheres, and (3) alloy spherules and fragments.
M.G.

N85-21204*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMPACTS ON EXPLORER 46 FROM AN EARTH ORBITING POPULATION c15
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 220-232 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

Explorer 46 was launched into Earth orbit in August 1972 to evaluate the effectiveness of using double-wall structures to protect against meteoroids. The data from the Meteoroid Bumper Experiment on Explorer 46 is reexamined and it is concluded that most of the impacts originated from an Earth orbiting population. The probable source of this orbiting population is solid rocket motors fired in Earth orbit.
Author

N85-21205*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IN-SITU DETECTION OF MICRON-SIZED DUST PARTICLES IN NEAR-EARTH SPACE
E. Gruen (Max-Planck-Inst. fuer Kernphysik, Heidelberg) and Herbert A. Zook *In its* Orbital Debris Mar. 1985 p 233-246 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

In situ detectors for micron sized dust particles based on the measurement of impact ionization have been flown on several space missions (Pioneer 8/9, HEOS-2 and Helios 1/2). Previous measurements of small dust particles in near-Earth space are reviewed. An instrument is proposed for the measurement of micron sized meteoroids and space debris such as solid rocket exhaust particles from on board an Earth orbiting satellite. The instrument will measure the mass, speed, flight direction and electrical charge of individually impacting debris and meteoritic particles. It is a multicoincidence detector of 1000 sq cm sensitive area and measures particle masses in the range from 10 to the -14th power g to 10 to the -8th power g at an impact speed of 10 km/s. The instrument is lightweight (5 kg), consumes little power (4 watts), and requires a data sampling rate of about 100 bits per second.
M.G.

N85-21206*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HYPERVELOCITY IMPACT INVESTIGATIONS AND METEOROID SHIELDING EXPERIENCE RELATED TO APOLLO AND SKYLAB
Burton G. Cour-Palais *In its* Orbital Debris Mar. 1985 p 247-275 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

Generic hypervelocity impact related topics and specific Apollo/Skylab related investigations are reviewed. Cratering and spallation mechanisms and the relationships between the effecting physical parameters are discussed. Design and material requirements for meteoroid shielding structures are also addressed.

Penetration resistance and failure mode studies for Apollo/Skylab components are reviewed. M.G.

N85-21207*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLID PARTICLE ENVIRONMENT AND PROTECTION FOR THE GALILEO ORBITER c18
Andrew J. Beck and Robert Bamford *In its* Orbital Debris Mar. 1985 p 276-278 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

Design requirements, component failure, and shield design relative to the Galileo orbiter are listed. Information is given in outline form. R.J.F.

N85-21208*# Boeing Aerospace Co., Seattle, Wash.
SPACE DEBRIS PROTECTION FOR A REUSABLE ORBITAL TRANSFER VEHICLE c18
Eldon E. Davis and Ray Sperber *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 279-286 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The protection of a reusable transfer vehicle from space debris is discussed. The results of a debris protection analysis are given. It was concluded that a shielding thickness of 0.62mm (24 mils) equivalent aluminum was needed when using a good double wall design. An additional 0.43 mm (18 mils) of shielding was needed during on-orbit storage time between flights. R.J.F.

N85-21209*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PARAMETRIC ANALYSIS: SOC METEOROID AND DEBRIS PROTECTION c18
Robert Kowalski *In its* Orbital Debris Mar. 1985 p 287-294 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The meteoroid and man made space debris environments of an Earth orbital manned space operations center are discussed. Protective shielding thickness and design configurations for providing given levels of no penetration probability were also calculated. Meteoroid/debris protection consists of a radiator/shield thickness, which is actually an outer skin, separated from the pressure wall, thickness by a distance. An ideal shield thickness, will, upon impact with a particle, cause both the particle and shield to vaporize, allowing a minimum amount of debris to impact the pressure wall itself. A shield which is too thick will crater on the outside, and release small particles of shield from the inside causing damage to the pressure wall. Inversely, if the shield is too thin, it will afford no protection, and the backup must provide all necessary protection. It was concluded that a double wall concept is most effective. R.J.F.

N85-21210*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE HEAT REJECTION RADIATIORS: METEOROID/DEBRIS CONSIDERATION c18
J. Gary Rankin *In its* Orbital Debris Mar. 1985 p 295-298 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The effect of the meteoroid/space debris environment on the design and evolution of spacecraft waste heat rejection radiator systems is discussed. Active radiator systems; i.e., systems in which waste heat is collected from the various heat sources within a spacecraft and delivered to the radiator system by a heat transport loop are emphasized. The heat is distributed over the radiator area and thus rejected to space. Present and future systems are discussed. R.J.F.

N85-21211*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES AND ORBITAL RETRIEVAL c15
Rudolph J. Adornato *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 299-315 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

Within the capabilities of the Space Shuttle Orbiter, a broad range of services which can be made available to the satellite user community as summarized. Payload deployment, close proximity retrieval, and a number of other mission related functions are discussed. The focus here is on close proximity retrieval and retrieval of payloads in higher energy low Earth orbits. R.J.F.

N85-21212*# Spacetech, Inc., State College, Pa.
A REMOTELY CONTROLLED ORBITING RETRIEVER c15
Marshall H. Kaplan *In* NASA. Lyndon B. Johson Space Center Orbital Debris Mar. 1985 p 316-331 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

A preliminary design effort was recently carried out to investigate methods of removing a certain class of space objects from Shuttle type orbits. Specifically, expired satellites, upper stages, and other objects of potential danger to the Shuttle are the targets of the study. The Trash Remover and Satellite Hauler (TRASH-1) design effort was broken into several disciplines: mission analysis, systems engineering, dynamics and control, power, thermal, and propulsion. A basic requirements is that TRASH-1 go up in the Shuttle. It must be reusable and capable of disposing of more than one item per mission for cost effectiveness. These requirements imply TRASH-1 should use current technology, be modular in design, and be relatively maneuverable. In order to maximize utility, it should be able to both capture and deorbit objects. The design was a basic bus with attachable modules which can either capture or deorbit, depending on the module. R.J.F.

N85-21213*# Texas Univ., Austin. Dept. of Aerospace and Engineering Mechanics.
THE LONG TERM BEHAVIOUR OF EARTH ORBITS AND THE IMPLICATIONS FOR DEBRIS CONTROL c13
Alan C. Mueller *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 332-348 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 03C

GEO orbits with inclinations which remain less than 45 degrees are very stable. Although the inclination of the orbital plane may vary as much as 15 degrees over a period of about 50 years, the orbit altitude will always remain within a few hundred kilometers of geosynchronous altitude, GEO orbits with inclinations greater than 45 degrees exhibit remarkable instabilities ir the eccentricity due to gravitational resonance. Over a period of a century the eccentricity can reach such a large value that reentry is a possibility. The combined effects of the Sun, Moon, and oblate Earth play a significant role in determining the lifetime of a GEO transfer orbit. Depending on the initial orientation of the orbital plane with respect to the Sun and Moon, lifetimes may vary from under 6 months to over several hundred years. Transfer orbits with inclinations over 45 degrees show strong instabilities in the perigee altitude resulting in generally short lifetimes of less than a few years. All transfer orbits can be designed to decay within one year if the initial perigee altitude is less than 231 km. However, there are restrictions on orbit plane placement and time of year of launch.
Author

N85-21214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DEBRIS IN THE GEOSTATIONARY ORBIT RING, THE ENDLESS SHOOTING GALLERY: THE NECESSITY FOR A DISPOSAL POLICY c13
David H. Suddeth *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 349-364 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 03C

NASA is considering establishing a policy for the limitation of the physical crowding of the geostationary orbit. The proposed policy is intended to address the following issues: (1) deal only with geostationary altitudes; (2) illustrate the unique value and usefulness of the geostationary orbit ring; (3) describe the orbital dynamics as simply as possible; (4) describe the current spacecraft

and debris situation; (5) briefly review current industry and agency policies; (6) project future trends of physical crowding with the present nonpolicy; (7) propose solutions that can be implemented in the near future; and (8) use previous work as much as desirable. G.L.C.

N85-21215*# National Aeronautics and Space Administration, Washington, D. C.
THE INTERNATIONAL ENVIRONMENT UNISPACE '82 AND THE ITU: A RELATIONSHIP BETWEEN ORBIT-SPECTRUM RESOURCE ALLOCATION AND ORBITAL DEBRIS c84
Dean Olmstead *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 372-378 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 05D

The 1985 Space WARC will examine and potentially modify the current geostationary orbit spectrum resource allocation methodology. Discussions in this international political environment could likely associate the geostationary orbital debris issue with the politicized issue of orbit spectrum allocation. G.L.C.

N85-21216*# RAND Corp., Santa Monica, Calif.
TRANSMISSION AND ORBITAL CONSTRAINTS IN SPACE-RELATED PROGRAMS: BRIEFING SUMMARY
A. I. Hiebert *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 379-392 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/F A01 CSCL 22A

Research was initiated to develop a capability for predicting and analyzing the spectrum/orbital geometry requirements of current and projected U.S. and international space related systems. Essential components of the project include development of a comprehensive space environment data base and computer analysis programs. This capability will provide a resource for evaluating engineering and architectural designs, identifying and analyzing the impact of intentional and unintentional electromagnetic (EM) interference, and predicting probable saturation conditions in spectrum usage and satellite/orbital positions. Assessments of means for accommodating the anticipated growth are also an important part of the study project. G.L.C.

N85-21217*# Air Force Space Div., Los Angeles, Calif.
AIR FORCE SATELLITE POSITION MANAGEMENT c15
R. Davis *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 399-401 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The Space Act of 1958 identified the Department of Defense as responsible for conducting military operations in space. Subsequently, the United States Air Force was assigned to act as the DOD's executive agent for space. In addition, the Air Force is responsible for acquisition and launch of DOD space systems. Within the Air Force, space related roles and activities have been delegated to several subordinate organizations and agencies. The roles and responsibilities of agencies are still evolving. The Air Force has designated the Air Force System Command's Space Division as its office of primary responsibility for satellite position management. Spacecraft program offices at Space Division are required by regulation to include position management planning in both prelaunch and orbital phases of spacecraft development and operation. G.L.C.

N85-21218*# Battelle Columbus Labs., Ohio. Space Systems and Applications.
ORBITAL DEBRIS POLICY ISSUES: BATTELLE INVOLVEMENT AND SOME PERSONAL OBSERVATIONS
Donald S. Edgecombe *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 402-409 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The possible hazards presented by orbital debris have been a matter of concern since the early 1960s. The area of initial concern was the potential hazard of the Earth from reentering debris. In the very early days of the space program, it was believed that only specially protected objects would survive reentry. Subsequent events showed this to be incorrect. The recognition of the potential hazard of orbital debris to orbiting objects did not occur until the late 1970s. Concern over this potential hazard has increased, and has also given rise to a number of policy issues. These issues are, at present, largely unresolved. G.L.C.

N85-21219*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONSIDERATIONS FOR POLICY ON MAN-MADE DEBRIS PROPAGATION CONTROL
D. Fielder *In its* Orbital Debris Mar. 1985 p 410-418 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The present rates of man-made, space object propagation are such that there is a real probability of self propagation which, if uncontrolled can lead to a serious limitation to future uses of spacecraft for beneficial purposes. Effective control over the debris issue requires adoption and adherence to policy at a world wide level (any one nation's unknowing, selfish or deliberately adverse action can conceivably jeopardize other useful applications of space satellites for years into the future). The near-term environment may not seriously jeopardize the near-term missions. However, absence of control and/or nonadherence to a control policy in the near-term can result in a debris environment that can severely limit long - term mission opportunities. The data upon which these observations are based continues to be investigated. These investigations tend to validate the preceding observations and emphasize the need for near-term action to establish responsible control policy and implementation actions. Author

N85-21220*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ENVIRONMENT DEFINITION, LARGE PARTICLES
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 419-420 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The orbital debris environment of objects larger than 1 sq met. in low Earth orbit (LEO) is fairly well defined. Objects of this size and altitude are tracked by NORAD with sufficient accuracy that collisions can be avoided by maneuvering a spacecraft away from regions of close approach. However for sizes smaller and at the higher geosynchrnous altitudes, the environment is not so well defined, and must be approached statistically. In order to determine if a significant number of these particles exist, or can be realistically produced, to cause a problem, a combination of modeling and data gathering is required. B.G.

N85-21221*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MODELING
Herbert A. Zook *In its* Orbital Debris Mar. 1985 p 421-423 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

A prediction of the future population of satellites, satellite fragments, and assorted spacecraft debris in Earth orbit can be reliably made only after three conditions are satisfied: (1) the size and spatial distributions of these Earth-orbiting objects are established at some present-day time; (2) the processes of orbital evolution, explosions, hypervelocity impact fragmentation, and atmospheric drag are understood; and (3) a reasonable traffic model for the future launch rate of Earth-orbiting objects is assumed. The theoretician will then take these three quantities as input data and will carry through the necessary mathematica and numerical analyses to project the present-day orbital population into the future. Author

N85-21222*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MEASUREMENTS
Andrew E. Potter *In its* Orbital Debris Mar. 1985 p 424-425 (For primary document see N85-21188 12-12)

Avail: NTIS HC A20/MF A01 CSCL 22A

The debris population is divided into small and large regimes. NORAD is the source of data in the size range above 10 cm. For the small (< 10 cm) debris particles, satellite-borne instrumentation could be used to obtain the necessary data. These results can then be fed into models of the debris population. These measurements are designed to give some reality to the models which estimate the number of particles produced from an explosion or an impact. B.G.

N85-21223*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ENVIRONMENT DEFINITION, SMALL PARTICLES, DIAMETER LESS THAN OR EQUAL TO 1 MM
In its Orbital Debris Mar. 1985 p 426-429 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22A

The collection of particles of diameters one millimeter and less far outnumbers the larger particle distribution in orbit. These small particles cannot be tracked from ground based radar as can the larger debris, therefore, there is greater uncertainty in their properties. The population is growing from contributions due to collisions of larger debris, explosions, and aluminum oxide particles from solid rocket motors. The solid rocket motor contribution is the prominent growth parameter, and the input from Space Shuttle deployed upper stages will range between 50,000 and 100,000 pounds per year. The environment is important because of the different design problems that will be posed to the engineer and scientist. The emphasis shifts from catastrophe deign, probability versus exposure time, and tracking-avoidance, to a continuous degradation problem. Author

N85-21224*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACECRAFT HAZARD AND SHIELDING REQUIREMENTS **c18**
In its Orbital Debris Mar. 1985 p 430-436 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

The elements related to hazard assessment (systems damage criteria, impact damage assessment, and mission success assessment algorithms) of the proposed 10-yr space debris assessment plan were reviewed for validity of the research elements; accuracy of the proposed effort and cost; duration of the task element; and interaction with the other elements of the plan. B.G.

N85-21225# Committee on Commerce, Science, and Transportation (U. S. Senate).
COMMERCIAL SPACE LAUNCHES
Washington GPO 1984 19 p Rept. to accompany H. R. 3942 presented by the Comm. on Com., Sci., and Transportation, 98th Congr., 2nd Sess., 3 Oct. 1984
(S-Rept-98-656; GPO-51-010) Avail: US Capitol, Senate Document Room

This bill is to establish a framework within which expendable launch vehicles (ELVs) and their associated facilities and launch services may be licensed for commercial launches. This legislation also designates the Department of Transportation (DOT) as the lead Federal agency to facilitate and expedite the issuance and transfer of commercial space launch licenses. Author

N85-21226*# National Aeronautics and Space Administration, Washington, D. C.
THE SPACE FLIGHT OF THE SOVIET-INDIAN CREW
S. A. Nikitin Mar. 1985 10 p Transl. into ENGLISH from "Kosmicheskiy Pol3t Sovetsko-Indiyskogo Ekiphazha" (USSR), Priroda, no. 7, Jul. 1984 p 66-68 Original language doc. was announced in IAA as A84-46847 Transl. by The Corporate Word, Pittsburgh, Pa. Original doc. prep. by Interkosmos Council, Acad. of Sci.
(NASA-TM-77615; NAS 1.15:77615) Avail: NTIS HC A02/MF A01 CSCL 22A

After a brief discussion of the Indian space program, the paper examines the flight of the Soyuz T-11, which included an Indian crew member. Particular attention is given to experiments conducted aboard Soyuz T-11, including the Optokinez vestibular experiment, the Vektor cardiac bioelectricity experiment, the yoga experiment for the counteraction of the negative effects of weightlessness, a supercooling experiment, and the Terra remote sensing experiment. L.M. (IAA)

N85-21227# Freiburg Univ. (West Germany). Inst. fuer Kristallographisches.
PREPARATION OF CRYSTAL GROWTH EXPERIMENTS IN SPACELAB: SI (FSLP), CdTe (D1), ZnS (D1) Final Report, Dec. 1982
Achim Eyer, Harald Leiste, Margarete Schuhmacher, and Herbert Walcher Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 147 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-045; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31

Crystal growth experiments on board Spacelab and TEXUS are dealt with. Improvements in the laboratory growth furnace and computer controled manufacturing of silicon flight-type samples are described. Doping striations of these crystals were analyzed. In the payload of ballistic rockets the behavior of halogen lamps under microgravity and floating zone growth of silicon were studied. A single ellipsoid mirror heating facility was developed and tested at laboratory scale. It was used to define two multiuser facilities, called Elli, one in Medea double rack in Spacelab the other in a TEXUS module. Author (ESA)

N85-22234*# Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
DEBRIS IMPACT ON EARTH-ORBITING SPACECRAFT
Dallas G. Smith *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 15p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-21228*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIATION EXPOSURE AND PERFORMANCE OF MULTIPLE BURN LEO-GEO ORBIT TRANSFER TRAJECTORIES
Sol H. Gorland 1985 14 p refs Presented at the JANNAF Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985
(NASA-TM-86946; E-2465; NAS 1.15:86946) Avail: NTIS HC A02/MF A01 CSCL 22A

Many potential strategies exist for the transfer of spacecraft from low Earth orbit (LEO) to geosynchronous (GEO) orbit. One strategy has generally been utilized, that being a single impulsive burn at perigee and a GEO insertion burn at apogee. Multiple burn strategies were discussed for orbit transfer vehicles (OTVs) but the transfer times and radiation exposure, particularly for potentially manned missions, were used as arguments against those options. Quantitative results concerning the trip time and radiation encountered by multiple burn orbit transfer missions in order to establish the feasibility of manned missions, the vulnerability of electronics, and the shielding requirements are presented. The performance of these multiple burn missions is quantified in terms of the payload and propellant variances from the minimum energy mission transfer. The missions analyzed varied from one to eight perigee burns and ranged from a high thrust, 1 g acceleration, cryogenic hydrogen-oxygen chemical prpulsion system to a continuous burn, 0.001 g acceleration, hydrogen fueled resistojet propulsion system with a trip time of 60 days. Author

N85-21213*# Texas Univ., Austin. Dept. of Aerospace and Engineering Mechanics.
THE LONG TERM BEHAVIOUR OF EARTH ORBITS AND THE IMPLICATIONS FOR DEBRIS CONTROL
Alan C. Mueller *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 332-348 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 03C

N85-21214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DEBRIS IN THE GEOSTATIONARY ORBIT RING, THE ENDLESS SHOOTING GALLERY: THE NECESSITY FOR A DISPOSAL POLICY
David H. Suddeth *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 349-364 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 03C

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N85-21229# Institute of Space and Astronautical Science, Tokyo (Japan).
DRAG-FREE SATELLITE SIMULATOR
Seiji Kawamura, Nobuki Kawashima, and Junichi Hirao Sep. 1984 12 p refs
(Rept-615; ISSN-0285-6808) Avail: NTIS HC A02/MF A01

The possibility of launching a satellite in a planetary orbit to test the general theory of relativity is being investigated. As a first step, a drag-free system model for a laboratory simulation was fabricated in order to acquire the fundamental technique and reveal unexpected problems. It was demonstrated that a two-dimensional drag-free simulator functioned successfully. It could continue operating faultlessly until the gas reservoir expired (4 hours); an important start for the realization of a drag-free satellite in the future. Author

N85-21230# Radian Corp., Austin, Tex.
FEASIBILITY OF PRODUCING COMMODITIES AND ELECTRICITY FOR SPACE SHUTTLE OPERATIONS AT VANDENBERG AIR FORCE BASE Final Report, Jun. - Sep. 1984
P. J. Murin, K. A. Ferland, A. F. Jones, S. N. Husband, and R. L. Leonard Nov. 1984 287 p refs
(Contract EPA-68-02-3171)
(RAD-84-203-001-80-21; EPA-600/7-84-100) Avail: NTIS HC A13/MF A01 CSCL 22D

The report gives results of a preliminary screening study of the technical and economic feasibility of the on-site production of commodities (liquid propellant and gases) and electricity to support space shuttle launch activities at Vandenberg Air Force Base (VAFB). Both commercial and developing systems were considered. Systems to supply electricity were considered to meet continuous electricity demands only, critical launch demands only, or both continuous and critical launch demands. In addition to systems to supply commodities only, several systems to produce both commodities and electricity were considered. All systems were evaluated for technical risk, conversion efficiency, environmental impacts, reliability, and economics. Author (GRA)

N85-22226*# South Dakota State Univ., Brookings. Dept. of Physics.
CONSIDERATIONS FOR UPGRADING MODIFICATIONS TO THE MARSHALL SPACE FLIGHT CENTER'S X-RAY CALIBRATION FACILITY
J. H. Kitterman *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-21231*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED RESEARCH AND TECHNOLOGY PROGRAMS FOR ADVANCED HIGH-PRESSURE OXYGEN-HYDROGEN ROCKET PROPULSION
S. J. Marsik and S. F. Morea (NASA. Marshall Space Flight Center) 1985 14 p refs Proposed for presentation at the 1985 JANNAF Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985 (NASA-TM-86969; E-2495; NAS 1.15:86969) Avail: NTIS HC A02/MF A01 CSCL 20H

A research and technology program for advanced high pressure, oxygen-hydrogen rocket propulsion technology is presently being pursued by the National Aeronautics and Space Administration (NASA) to establish the basic discipline technologies, develop the analytical tools, and establish the data base necessary for an orderly evolution of the staged combustion reusable rocket engine. The need for the program is based on the premise that the USA will depend on the Shuttle and its derivative versions as its principal Earth-to-orbit transportation system for the next 20 to 30 yr. The program is focused in three principal areas of enhancement: (1) life extension, (2) performance, and (3) operations and diagnosis. Within the technological disciplines the efforts include: rotordynamics, structural dynamics, fluid and gas dynamics, materials fatigue/fracture/life, turbomachinery fluid mechanics, ignition/combustion processes, manufacturing/producibility/nondestructive evaluation methods and materials development/evaluation. An overview of the Advanced High Pressure Oxygen-Hydrogen Rocket Propulsion Technology Program Structure and Working Groups objectives are presented with highlights of several significant achievements. Author

N85-21232*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NATURAL ENVIRONMENT DESIGN CRITERIA FOR THE SPACE STATION DEFINITION AND PRELIMINARY DESIGN
William W. Vaughan and Claude E. Green Mar. 1985 16 p Revised
(NASA-TM-86498; NAS 1.15:86498) Avail: NTIS HC A02/MF A01 CSCL 22B

The natural environment design criteria for the Space Station Program (SSP) definition and preliminary design are presented. Information on the atmospheric, dynamic and thermodynamic environments, meteoroids, radiation, magnetic fields, physical constants, etc. is provided with the intension of enabling all groups involved in the definition and preliminary design studies to proceed with a common and consistent set of natural environment criteria requirements. The space station program elements (SSPE) shall be designed with no operational sensitivity to natural environment conditions during assembly, checkout, stowage, launch, and orbital operations to the maximum degree practical. M.G.

N85-21233*# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
ENGINEERING CALCULATIONS FOR COMMUNICATIONS SATELLITE SYSTEMS PLANNING Interim Report, 15 Jul. 1983 - 14 Jul. 1984
C. A. Levis, C. H. Martin, C. H. Reilly, D. J. Gonsalvez, and Y. Yamaura Mar. 1985 59 p refs
(Grant NAG3-159)

(NASA-CR-175552; NAS 1.26:175552; ESL-713533-5) Avail: NTIS HC A04/MF A01 CSCL 22B

An extended gradient search code for broadcasting satellite service (BSS) spectrum/orbit assignment synthesis is discussed. Progress is also reported on both single-entry and full synthesis computational aids for fixed satellite service (FSS) spectrum/orbit assignment purposes. Author

N85-21234# Committee on Foreign Relations (U. S. Senate).
BRUSSELS SATELLITE CONVENTION
Washington GPO 1984 26 p Rept. to accompany Tr. Doc. 98-31 presented by the Comm. on Foreign Relations, 98th Congr., 2nd Sess., 27 Sep. 1984
(S-Exec-Rept-98-52; GPO-31-119) Avail: US Capitol, Senate Document Room

Reasons for ratification of the Brussels Satellite Convention (1974) by the United States Senate are provided by a number of sources. These include the Motion Picture Association of America, the Motion Picture Export Association of America, and the National Association of Broadcasters. The Brussels Convention relates to satellite signal piracy. R.S.F.

N85-21235# Wright State Univ., Dayton, Ohio.
MODAL CONTROL OF STRUCTURAL SYSTEMS Final Report, Jun. - Sep. 1983
D. F. Miller and W. R. Wells Wright-Patterson AFB, Ohio AFWAL Nov. 1984 32 p
(Contract F33615-83-C-3000)
(AD-A149734; AFWAL-TR-84-3054) Avail: NTIS HC A03/MF A01 CSCL 13/13

There is much interest in the practical control of large space structures such as space transportation systems and large communication satellites. The control task is normally thought of in terms of maintaining specified shape configurations, orientation and alignment, vibration suppression and pointing accuracy, etc. Because of their inherent flexibility, they are generally analyzed as distributed parameter systems which creates difficulties in the design and analysis of controllers for them. Modal control techniques have been developed to bypass problems associated with distributed parameter theory. Modal control is built upon the notion that certain specified system modes can be controlled by appropriate design of the associated closed-loop eigenvalues. This reduces the number of sensors and actuators needed to effect the control of the structure. An undesirable phenomenon, referred to as observation and control spillover, can occur if the number of sensors and actuators used is small. Spillover refers to the phenomenon in which energy intended to go solely into the controlled modes leaks into the uncontrolled modes. This report discusses the control of flexible systems described by a generalized one-dimensional wave equation which relates the structure displacement to the force distribution acting on the structure. Optimal control involving the minimization of a quadratic performance index representing control and modal energy content is considered. Typically this control formulation leads to a state feedback algorithm. GRA

N85-21236# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
DESCRIPTION OF THE SSB/A (SPECIAL SENSOR B/AEROSPACE X-RAY SPECTROMETER
W. A. Kolasinski and P. F. Mizera 30 Sep. 1984 44 p
(Contract F04701-83-C-0084)
(AD-A150040; SD-TR-84-47) Avail: NTIS HC A03/MF A01 CSCL 22/2

In this report we describe a scanning X-ray and gamma-ray spectrometer designed and built at The Aerospace Corporation's Space Sciences Laboratory for the Air Force Technical Applications Center (AFTAC). Designated as Special Sensor B/Aerospace (SSB/A), the instrument is on the Flight 6 Spacecraft of the Defense Meteorological Satellite Program (DMSP). The sensor is designed to locate and image atmospheric X-ray sources while providing data on their intensity as a function of energy in the 2-to-100-keV energy range. A small hydrogen Lyman-alpha emission detector has been placed on one of the two scanning heads so as to provide data coverage simultaneously with the X-ray measurements. Two Geiger-Mueller counters have also been mounted on the stationary platform of the spectrometer to provide measurements of electron fluxes for estimating local background in the X-ray measurements. GRA

N85-21237# SATCOM International, Paris (France).
MULTIMISSION ADVANCED CONFIGURATIONS STUDY Final Report
C. Cougnet, J. L. Perbos, B. LeStradic, Ph. SaintAubert, and P. J. Waples Toulouse MATRA Espace Oct. 1983 92 p
(Contract ESA-5279/82/F-RD(SC))
(MATRA-DM.51/CC/FL/0151.83; ESA-CR(P)-1944) Avail: NTIS HC A05/MF A01

Multimission telecommunication satellite payload options and launcher requirements for long term mission initial launch; replacement payload with fuel top up; classical solutions; and comparison with mid term mission are summarized. Long term mission requirements (20 yr) can be satisfied by an initial launch of a reduced capability payload, but with a power system capable of maintaining a full mission payload for 20 yr, and subsequent replacement of the initial payload by a full mission payload which would also contain top-up fuel for stationkeeping. Long term mission requirements could also be satisfied by the launch of two spacecraft based on L-SAT, and occupying the same orbital slot with minimum additional station-keeping equipment. These spacecraft would have a 10 yr lifetime. A mid term mission using dichroics offers a saving of 300kg over a classical solution using a single launch. Alternatively the mission could be satisfied by splitting the payload into two and carrying each on a EUROSTAR class spacecraft. Author (ESA)

N85-21238# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
SOUNDING ROCKET PROGRAM AERONOMIE. THE PAYLOAD M-I IN THE PROJECT MAP-WINE Final Report, Jun. 1984
Heinz Auchter, Hans Demharter, and Hermann Waldmann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 77 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-046; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

A payload system and a sounding rocket program are described. The payload was equipped with three experiments, and attitude control, and a land recovery system. The sounding rocket motor was a Skylark 6 type. Positioning, transmission to the ground, and recovery were the main technical functions of the system. Infrared radiation in the wave ranges 2.5 to 17 microns and 50 to 160 microns as well as 1.27 micron were measured in order to determine the influence of O, CO2, O3, NO, OH, and O2 emission on the energy balance in the altitude between 70 and 180 km. Author (ESA)

N85-21239# Fraunhofer Inst. fuer Physikalische Messtechnik, Frieburg (West Germany).
ATTITUDE DATA CONSISTENCE CHECK OF ROCKET PAYLOADS Final Report, Dec. 1983
Reinhard Grabowski Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 34 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-049; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7

The attitude of high-atmospheric payloads is examined. A rocket-borne attitude measuring device was used and primary data was converted into Euler angles. For error detection in the Euler angle values, a consistence check based on an analysis of variation of the Euler angles in time was successfully applied on attitude data of nutating payloads. Author (ESA)

N85-21190*# North American Air Defense Command, Peterson AFB, Colo.
HISTORY OF SATELLITE BREAK-UPS IN SPACE
John Gabbard *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 30-38 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21191*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NORAD'S PARCS SMALL SATELLITE TESTS (1976 AND 1978)
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 39-44 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21204*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMPACTS ON EXPLORER 46 FROM AN EARTH ORBITING POPULATION
Donald J. Kessler *In its* Orbital Debris Mar. 1985 p 220-232 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21211*# Grumman Aerospace Corp., Bethpage, N.Y.
SATELLITE SERVICES AND ORBITAL RETRIEVAL
Rudolph J. Adornato *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 299-315 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21212*# Spacetech, Inc., State College, Pa.
A REMOTELY CONTROLLED ORBITING RETRIEVER
Marshall H. Kaplan *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 316-331 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21217*# Air Force Space Div., Los Angeles, Calif.
AIR FORCE SATELLITE POSITION MANAGEMENT
R. Davis *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 399-401 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21417# Joint Publications Research Service, Arlington, Va.
DISTANCE-INERTIAL GUIDANCE OF LAUNCH VEHICLE DESCRIBED
Guo Xiaokuan, Yue Peiyu, and An Weilian *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 31-36 refs Transl. into ENGLISH from Zidonghua Xuebao (Beijing), no. 4, Oct. 1984 p 361-364 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

N85-22225*# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
NON-CONTACTING ELECTROMAGNETIC DE-SPIN SYSTEM FOR EARTH ORBITING SATELLITES
Prasad K. Kadaba *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 27p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-21240*# Lockheed Missiles and Space Co., Palo Alto, Calif.
STS ATMOSPHERIC LUMINOSITIES Final Report
S. B. Mende 14 May 1984 24 p refs
(Contract NASw-3862)
(NASA-CR-175514; NAS 1.26:175514; LMSC/D961899-D145)
Avail: NTIS HC A02/MF A01 CSCL 22B

During the STS-8 space shuttle mission special photographic and TV operations were carried out to record the properties of the spacecraft induced luminosities. One of these luminous phenomena is the quiescent vehicle glow which was photographed during the STS-8 mission with an image intensified photographic camera, with and without an objective grating. During the latter part of the mission the altitude of the shuttle was relatively low (120 n.m. = 222 km) and unprecedentedly high intensity of the glow was observed. The crew reported that the glow was easily visible to the naked eye. The proper orientation of the shuttle with respect to the velocity vector and the objective grating permitted the exposure of good objective spectrum of the glow in the visible region. From the results it is clear that the spectrum appears to be a continuum as observed by the image intensifier objective grating camera. Qualitative examination of the data shows that there is very tail little glow ion the wavelength range of 4300 to about 5000 angstroms. Above 5000 angstroms the glow becomes stronger towards the red and then it falls off towards higher wavelength and of the spectrum presumably because of the responsivity of the device. B.W.

N85-21241*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE BOOSTER THRUST IMBALANCE ANALYSIS
William R. Bailey and Douglas L. Blackwell Jan. 1985 35 p refs (NASA-TM-86493; NAS 1.15:86493) Avail: NTIS HC A03/MF A01 CSCL 22D

An analysis of the Shuttle SRM thrust imbalance during the steady-state and tailoff portions of the boost phase of flight are presented. Results from flights STS-1 through STS-13 are included. A statistical analysis of the observed thrust imbalance data is presented. A 3 sigma thrust imbalance history versus time was generated from the observed data and is compared to the vehicle design requirements. The effect on Shuttle thrust imbalance from the use of replacement SRM segments is predicted. Comparisons of observed thrust imbalances with respect to predicted imbalances are presented for the two space shuttle flights which used replacement aft segments (STS-9 and STS-13). Author

N85-21242*# Texas Univ., Dallas. Center for Space Sciences.
STUDY OF OUTGASSING AND DECOMPOSITION OF SPACE SHUTTLE HEAT PROTECTION TILES, FILLERS AND ADHESIVE Final Report
Bertha L. Proctor and John H. Hoffman [1982] 26 p refs
(Grant NAG1-256)
(NASA-CR-175565; NAS 1.26:175565) Avail: NTIS HC A03/MF A01 CSCL 22B

The purpose of this project was to determine the chemicals desorbing from the space shuttle heat protection tiles. The original protocol for this project involved direct insertion probe mass spectrometry (DIPMS) analysis of the outgassing products from the tiles. However, this method proved unsatisfactory due to the large number of compounds desorbing from the tiles. A purge and trap technique was then employed to collect and separate the chemicals desorbing from the tiles. The maximum temperature in this analysis was 180 C which is the gas chromatograph fused silica capillary column's temperature limit. The desorption was also carried out at atmospheric pressure with helium as the purge gas. A description of the modified protocol is given. All compounds are tentatively identified. R.J.F.

N85-21243# Committee on Science and Technology (U. S. House).
RESULTS OF SPACE SHUTTLE FLIGHT 41-D
Washington GPO 1984 23 p Hearing before the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 115, 25 Sep. 1984 (GPO-39-481) Avail: Committee on Science and Technology

The committee reviewed the results of the space shuttle mission and the first flight of the spaceship Discovery. The mission, designated as STS 41-D, appeared to be an outstanding success,

with all the flight objectives being accomplished, including the placement of commercial payloads in their proper orbits. G.L.C.

N85-21244*# National Aeronautics and Space Administration, Washington, D. C.
AN AIR-BREATHING BALLISTIC SPACE TRANSPORTER FOR EUROPE
P. A. Kramer and R. D. Buehler (Stuttgart Univ.) Mar. 1985 15 p refs Transl. into ENGLISH of Conf. Paper from Inst. for Space Propulsion, Stuttgart Univ. Presented at the Ann. Conv. of the DGLR, Stuttgart, 5-7 Oct. 1982 Transl. by The Corporate Word, Inc., Pittsburgh,
(Contract NASW-4006)
(NASA-TM-77645; NAS 1.15:77645) Avail: NTIS HC A02/MF A01 CSCL 22B

With increasing transport requirements, reusable space transporters again receive serious consideration in Europe as successors to the Ariane family. The paper deals with a hydrogen-ramjet-propelled, 1-1/2-stage reusable ballistic space transporter with vertical take-off and landing and using liquid hydrogen/oxygen rockets. This novel concept was developed in a theoretical study at the University of Stuttgart. The results are compared with recently published studies of several other European space transporter concepts. The data derived for the Istra - concept are: 15.4 Mg payload into low Earth-orbit, 155 Mg gross lift-off mass, 10% payload ratio, which represents a 57% propellant saving, and 44% reduction in dry mass (structure and engines) compared with comparable two-stage pure rocket concepts. Author

N85-21245*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPACTS OF SPACE SHUTTLE THERMAL PROTECTION SYSTEM TILE ON F-15 AIRCRAFT VERTICAL TILE
William L. Ko Mar. 1985 24 p refs
(NASA-TM-85904; H-1248; NAS 1.15:85904) Avail: NTIS HC A02/MF A01 CSCL 22B

Impacts of the space shuttle thermal protection system (TPS) tile on the leading edge and the side of the vertical tail of the F-15 aircraft were analyzed under different TPS tile orientations. The TPS tile-breaking tests were conducted to simulate the TPS tile impacts. It was found that the predicted tile impact forces compare fairly well with the tile-breaking forces, and the impact forces exerted on the F-15 aircraft vertical tail were relatively low because a very small fraction of the tile kinetic energy was dissipated in the impact, penetration, and fracture of the tile. It was also found that the oblique impact of the tile on the side of the F-15 aircraft vertical tail was unlikely to dent the tail surface. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-21246*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
WIND-WEIGHTING FOR SOUNDING ROCKETS WITH A TELEMETRY SYSTEM
Frank M. Boykin Apr. 1985 12 p
(NASA-TP-2438; NAS 1.60:2438) Avail: NTIS HC A02/Mf A01 CSCL 09F

A system to provide wind data which can be used for wind-weighting sounding rockets is described. The system uses an automatic tracking telemetry antenna and ranging system together with an inexpensive airborne transponder-type radiosonde. R.J.F.

N85-22230*# Berry Coll., Mount Berry, Ga. Dept. of Physics.
EVALUATION OF OMV RANGING AND DOCKING SYSTEMS
Malcolm W. McDonald *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 18p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22A

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-21247 Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.
STABILITY ANALYSIS OF FLEXIBLE SPACERAFT WITH PID CONTROLLER
J. deLafontaine Nov. 1984 59 p refs
(CRC-1372) Avail: Issuing Activity

A graphical method for the design and analysis of a flexible spacecraft controller is presented. It can handle as many modes as desired, in constrained or unconstrained form; modal separability is not assumed and the method is exact when the spacecraft axes are uncoupled. The definition of a system function, independent of the controller parameters, simplifies the determination of the system stability boundaries. It also allows the investigation of the modal separability assumption, resulting in a criterion for its validity. Stabilization through structural damping and flexible modes filtering is illustrated using graphs of the system function. Closed-form approximations are derived in order to complement the exact, numerical method. Extensions to systems with loop delay and nonlinear elements are also included along with applications to the LSAT-1 Roll axis. Author

N85-21248*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA/MSFC GROUND EXPERIMENT FOR LARGE SPACE STRUCTURE CONTROL VERIFICATION
Henry B. Waites, Sherman M. Seltzer (Control Dyamics Co.), and Danny K. Tollison (Control Dynamics Co.) Dec. 1984 24 p refs Previously announced in IAA as A85-19528
(NASA-TM-86496; NAS 1.15:86496) Avail: NTIS HC A02/MF A01 CSCL 22B

Marshall Space Flight Center has developed a facility in which closed loop control of Large Space Structures (LSS) can be demonstrated and verified. The main objective of the facility is to verify LSS control system techniques so that on orbit performance can be ensured. The facility consists of an LSS test article which is connected to a payload mounting system that provides control torque commands. It is attached to a base excitation system which will simulate disturbances most likely to occur for Orbiter and DOD payloads. A control computer will contain the calibration software, the reference system, the alignment procedures, the telemetry software, and the control algorithms. The total system will be suspended in such a fashion that LSS test article has the characteristics common to all LSS. Author (IAA)

N85-21249*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEFINITION OF GROUND TEST FOR LARGE SPACE STRUCTURE (LSS) CONTROL VERIFICATION
H. B. Waites, G. B. Doane, III (Control Dynaics Co.), and Danny K. Tollison (Control Dynamics Co.) Nov. 1984 36 p
(NASA-TM-86495; NAS 1.15:86495) Avail: NTIS HC A03/MF A01 CSCL 22B

An overview for the definition of a ground test for the verification of Large Space Structure (LSS) control is given. The definition contains information on the description of the LSS ground

verification experiment, the project management scheme, the design, development, fabrication and checkout of the subsystems, the systems engineering and integration, the hardware subsystems, the software, and a summary which includes future LSS ground test plans. Upon completion of these items, NASA/Marshall Space Flight Center will have an LSS ground test facility which will provide sufficient data on dynamics and control verification of LSS so that LSS flight system operations can be reasonably ensured.
Author

N85-21250*# Pennsylvania State Univ., University Park. Dept. of Physics.
MASS ANALYSIS OF NEUTRAL PARTICLES AND IONS RELEASED DURING ELECTRICAL BREAKDOWNS ON SPACECRAFT SURFACES Final Report, 1 Sep. 1979 - 31 Dec. 1984
B. R. F. Kendall 16 Mar. 1985 32 p refs
(Grant NsG-3301)
(NASA-CR-175585; NAS 1.26:175585) Avail: NTIS HC A03/MF A01 CSCL 22B

Charged-particle fluxes from breakdown events were studied. Methods to measure mass spectra and total emitted flux of neutral particles were developed. The design and construction of the specialized mass spectrometer was completed. Electrical breakdowns were initiated by a movable blunt contact touching the insulating surface. The contact discharge apparatus was used for final development of two different high-speed recording systems and for measurements of the composition of the materials given off by the discharge. It was shown that intense instantaneous fluxes of neutral particles were released from the sites of electrical breakdown events. A laser micropulse mass analyzer showed that visible discoloration at breakdown sites were correllated with the presence of iron on the polymer side of the film, presumably caused by punch-through to the Inconel backing. Kapton samples irradiated by an oxygen ion beam were tested. The irradiated samples were free of surface hydrocarbon contamination but otherwise behaved in the same way as the Kapton samples tested earlier. Only the two samples exposed to oxygen ion bombardment were relatively clean. This indicates an additional variable that should be considered when testing spacecraft materials in the laboratory. E.A.K.

N85-21251*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION
David A. Anderton 1985 33 p
(NASA-EP-211; NAS 1.19:211) Avail: NTIS HC A03/MF A01 CSCL 22B

The official start of a bold new space program, essential to maintain the United States' leadership in space was signaled by a Presidential directive to move aggressively again into space by proceeding with the development of a space station. Development concepts for a permanently manned space station are discussed. Reasons for establishing an inhabited space station are given. Cost estimates and timetables are also cited. B.W.

N85-21252# Lockheed Missiles and Space Co., Palo Alto, Calif.
SCATHA (SPACECRAFT CHARGING AT HIGH ALTITUDES) PLASMA INTERACTION EXPERIMENT: SC-3 HIGH ENERGY PARTICLE SPECTROMETER; SC-8 ENERGETIC ION COMPOSITION EXPERIMENT Final Report, 1 Nov. 1975 - 30 Oct. 1984
E. G. Shelley, R. D. Sharp, R. W. Nightingale, and J. M. Quinn 30 Nov. 1984 53 p
(Contract N00014-76-C-0444)
(AD-A149728) Avail: NTIS HC A04/MF A01 CSCL 22/2

This report describes the results of the SC-3 (High Energy Particle Spectrometer) and SC-8 (Energetic Ion Composition Experiment) instruments flown on the SCATHA (Spacecraft Charging at High Altitudes) satellite, launched in January 1979 into a near geosynchronous orbit. The instruments measure electrons at energies of 0.05-5.0 MeV, protons of 1-100 MeV, and mass composition of ions in the range E/q=0.1-32. keV/e. Both instruments continue to be fully operational at this time. Principal results of the High Energy Particle Spectrometer have addressed radial profiles and energy spectra of energetic particles, the role of energetic particles in the charging and discharging of spacecraft dielectrics, the behavior of trapped electrons at flux levels near the Kennel-Petchek trapping limit, and the precipitation of energetic electrons into the ionosphere. The Energetic Ion Composition Experiment has provided the first ion composition data with routine pitch angle coverage in the vicinity of geosynchronous orbit. The advances resulting from this instrument can be grouped into four categories: (1) plasma injection and transport, (2) detailed structure of near-geosynchronous plasma distributions, (3) interactions between hot plasmas and spacecraft, and (4) global understanding arising from the synthesis of individual results. Additional keywords: abstracts, literature surveys, electric charge, space charge, particle flux, electron guns, ion guns. Author (GRA)

N85-21253# Control Dynamics Co., Huntsville, Ala.
ACOSS 17 (ACTIVE CONTROL OF SPACE STRUCTURES) Final Technical Report, 1 Feb. 1982 - 31 Jan. 1984
S. M. Seltzer, H. E. Worley, J. R. Glaese, M. L. Butler, V. L. Jones, and D. K. Tollison Griffiss AFB, N.Y. RADC Sep. 1984 266 p
(Contract F30602-82-C-0053; ARPA Order 3654; AF Proj. 3654)
(AD-A150007; CDC-0330284TR-DA09-AC004; RADC-TR-84-186)
Avail: NTIS HC A12/MF A01 CSCL 22/2

This is the Control Dynamics Company final technical report on extended analysis and evaluation of the Control Techniques of Large Space Structures. The research effort was primarily aimed at mathematical model development and control systems analysis and design tool development. Additional keywords; Spacecraft, Structural mechanics, Experimental design, Control theory, Stability, Damping, Cost analysis, Line of sight, Computations, Flow charting, Computer aided design. GRA

N85-21254# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
APPLICATION OF MODEL FOLLOWING CONTROL AND ESTIMATION TECHNIQUES TO ATTITUDE CONTROL OF MANEUVERING SPACECRAFT. PART 2: SIMULATION SOFTWARE DESCRIPTION
A. P. Terpstra, R. F. vandenDam, P. Th. L. M. vanWoerkom, and T. Zwartbol 7 Dec. 1983 44 p refs
(Contracts NIVR-1771; NIVR-1858)
(NLR-TR-82116-U-Pt-2; B8477222-Pt-2) Avail: NTIS HC A03/MF A01

Two computer programs were developed during a study of the application of modern control techniques to spacecraft attitude control. Simulation program tasks are attitude hardware simulation; implementation of digital estimation and control algorithms; and external interfaces. Program design aspects are discussed. Each module is described separately and flow charts are given. Implementation aspects specific to the computer used, and execution characteristics are discussed. Author (ESA)

N85-21202*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HYPERVELOCITY IMPACTS ON SKYLAB 4/APOLLO WINDOWS
Uel S. Clanton, Herbert A. Zook, and Richard A. Schultz (Lunar and Planetary Inst.) *In its* Orbital Debris Mar. 1985 p 177-189 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21207*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLID PARTICLE ENVIRONMENT AND PROTECTION FOR THE GALILEO ORBITER
Andrew J. Beck and Robert Bamford *In its* Orbital Debris Mar. 1985 p 276-278 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21208*# Boeing Aerospace Co., Seattle, Wash.
SPACE DEBRIS PROTECTION FOR A REUSABLE ORBITAL

TRANSFER VEHICLE
Eldon E. Davis and Ray Sperber *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 279-286 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21209*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PARAMETRIC ANALYSIS: SOC METEOROID AND DEBRIS PROTECTION
Robert Kowalski *In its* Orbital Debris Mar. 1985 p 287-294 refs (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21210*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE HEAT REJECTION RADIATIORS: METEOROID/DEBRIS CONSIDERATION
J. Gary Rankin *In its* Orbital Debris Mar. 1985 p 295-298 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

N85-21224*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACECRAFT HAZARD AND SHIELDING REQUIREMENTS
In its Orbital Debris Mar. 1985 p 430-436 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-21255# Institute of Space and Astronautical Science, Tokyo (Japan).
DEVELOPMENT OF FARADAY CUP ONBOARD MS-T5 FOR SOLAR WIND MEASUREMENTS
Kohichiro Oyama, Kazunori Akai, Kazuyuki Nakazawa (Japan Radio Co., Ltd.), Kunio Hirao, and Shinriki Tei (Musashi Inst. of Technol.) Dec. 1984 30 p refs
(Rept-616; ISSN-0285-6808) Avail: NTIS HC A03/MF A01

A Faraday cup which will be installed in Japan's first interplanetary satellite, MS-T5 is now ready to go. The cup which consists of four grids and ion collector was designed to measure ion density, bulk velocity and ion collector was designed to measure ion density, bulk velocity and ion temperature by utilizing spacecraft spinning. The range of these parameters to be measured are few, approximately several ten ions/cc for ion density, 10000 K for ion temperature and 300 Km approximately 700 km/sec for bulk velocity. Among three parameters to be measured, bulk velocity and ion density can be measured within 10% accuracy. Ion temperature can be obtained within the accuracy of approximately 20%. The following were undertaken: (1) To study the basic physics on the ion response to the rapidly changing potential; (2) To get a theoretical description of ion current versus satellite spin angle; (3) To check the theoretical equation by means of laboratory experiment; and (4) To make the software to process data after the satellite MS-T5 is launched. G.L.C.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-21256* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RING-CUSP ION THRUSTER WITH SHELL ANODE Patent
James S. Sovey, Vincent K. Rawlin, and Robert F. Roman, inventors (to NASA) Issued 21 Aug. 1984 6 p Filed 9 Mar. 1983 Supersedes N83-21903 (21 - 11, p 1783)
(NASA-Case-LEW-13881-1; NAS 1.71:LEW-13881-1; US-Patent-4,466,242; US-Patent-Appl-SN-473498; US-Patent-Class-60-202) Avail: US Patent and Trademark Office CSCL 21C

An improved ion thruster for low specific impulse operation in the 1500 sec to 6000 sec range has a multicusp boundary field provided by high strength magnets on an iron anode shell which lengthens the paths of electrons from a hollow cathode assembly. A downstream anode pole piece in the form of an iron ring supports a ring of magnets to provide a more uniform beam profile. A cylindrical cathode magnet can be moved selectively in an axial direction along a feed tube to produce the desired magnetic field at the cathode tip. Author

N85-21257 Department of the Air Force, Washington, D.C.
INTEGRATED INSULATION WALL ASSEMBLY Patent
C. C. Gnagy, inventor (to Air Force) Issued 29 Jan. 1985 8 p Supersedes AD-D010344
(AD-D011553; US-Patent-4,495,764; US-Patent-Appl-SN-498335; US-Patent-Class-60-255) Avail: US Patent and Trademark Office CSCL 21/8

An integrated three-component insulation wall assembly is disclosed. The wall assembly can be used by itself as an insulation wall assembly, or can be incorporated into a solid rocket motor case that is made of material fabricated using conventional layup construction methods, or can provide the contour stability necessary to allow its functioning as a mandrel for filament-winding a solid rocket motor case. It can also be spliced and reinforced across the splice. The insulation wall assembly comprises, in an integrated condition, an inner wall component, (i.e., a flame side wall component) which is laminated from woven reinforcements in an ablative matrix, a middle wall component of non-metallic honeycomb core material, and an outer wall (i.e., pressure side wall component). The inner wall component provides a fire barrier; the middle wall component provides thermal insulation; and the outer wall component provides structural stability. Author (GRA)

N85-21258*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RAIL ACCELERATOR TECHNOLOGY AND APPLICATIONS
Lynnette M. Zana and William R. Kerslake 25 Mar. 1985 18 p refs Presented at the JANNAF Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985; sponsored by the JANNAF Interagency Propulsion Committee
(NASA-TM-86947; E-2466; NAS 1.15:86947) Avail: NTIS HC A02/MF A01 CSCL 21H

Rail accelerators offer a viable means of launching ton-size payloads from the Earth's surface to space. The results of two mission studies which indicate that an Earth-to-Space Rail Launcher (ESRL) system is not only technically feasible but also economically beneficial, particularly when large amounts of bulk cago are to be delivered to space are given. An in-house experimental program at the Lewis Research Center (LeRC) was conducted in parallel with the mission studies with the objective of examining technical feasibility issues. A 1 m long - 12.5 by 12.5 mm bore rail accelerator as designed with clear polycarbonate sidewalls to visually observe the plasma armature acceleration. The general character of plasma/projectile dynamics is described for a typical test firing. R.J.F.

N85-21259*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VACUUM CHAMBER PRESSURE EFFECTS ON THRUST MEASUREMENTS OF LOW REYNOLDS NUMBER NOZZLES
James S. Sovey, Paul F. Penko, Stanley P. Grisnik, and Margaret V. Whalen 1985 12 p refs Presented at the 1985 JANNAF

Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985
(NASA-TM-86955; E-2440; NAS 1.15:86955) Avail: NTIS HC A02/MF A01 CSCL 21H

Tests were conducted to investigate the effect of vacuum facility pressure on the performance of small thruster nozzles. Thrust measurements of two converging-diverging nozzles with an area ratio of 140 and an orifice plate flowing unheated nitrogen and hydrogen were taken over a wide range of vacuum facility pressures and nozzle throat Reynolds numbers. In the Reynolds number range of 2200 to 12 000 there was no discernable viscous effect on thrust below an ambient to total pressure ratio of 1000. In nearly all cases, flow separation occurred at a pressure ratio of about 1000. This was the upper limit for obtaining an accurate thrust measurement for a conical nozzle with an area ratio of 140. Author

N85-21260*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPATIBILITY EXPERIMENTS OF FACILITIES, MATERIALS, AND PROPELLANTS FOR ELECTROTHERMAL THRUSTERS
Margaret V. Whalen, Stanley P. Grisnik, and James S. Sovey 1985 16 p refs Presented at the 1985 JANNAF Propulsion Meeting, San Diego, Calif., 9-12 Apr. 1985
(NASA-TM-86956; E-2479; NAS 1.15:86956) Avail: NTIS HC A02/MF A01 CSCL 21H

Experiments were performed to determine the compatibility of materials and propellants for electro-thermal thrusters. Candidate propellants for resistojet propulsion include carbon dioxide, methane, hydrogen, ammonia, and hydrazine. The materials being examined are grain stabilized platinum for resistojets for Space station and rhenium for high performance resistojets for satellites. Heater mass loss and deterioration of materials were evaluated. A coiled tube of platinum, with yttria dispersed throughout the base material to inhibit grain growth, was tested in carbon dioxide at 1300 C for 2000 hr. Post-test examination indicated the platinum-yttria heater would last over 100 000 hr with less than 10 percent mass loss. Short-term compatibility tests were conducted to test the integrity of the platinum-yttria in hydrogen, methane, carbon dioxide/methane mixtures and ammonia environments. In each of these 100 hr tests, the platinum-yttria mass change indicated a minimum coil life of 100 000 hr. Facility related effects were investigated in materials tests using rhenium heated to high tempertures. Vacuum facility water reduction was monitored using a mass spectrometer. In vacuum environments obtained using only diffusion pumping and those obtained with the assistance of cryogenic equipment there were mass gains in the rhenium heaters. These mass gains were the result of the high amount of oxygen and water contained in the gas. Propellant purity and preferred test facility environments are discussed. G.L.C.

N85-21261*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GaAs AND 3-5 COMPOUND SOLAR CELLS STATUS AND PROSPECTS FOR USE IN SPACE
Dennis J. Flood and David J. Brinker 1984 13 p refs Presented at the 4th European Symp. on Photovoltaic Generators in Space, Cannes, France, 18-20 Sep. 1984
(NASA-TM-86960; E-2485; NAS 1.15:86960) Avail: NTIS HC A02/MF A01 CSCL 10B

Gallium arsenide solar cells equal or supass the best silicon solar cells in efficiency, radiation resistance, annealability, and in the capability to produce usable power output at elevated temperatures. NASA has been involved in a long range research and development program to capitalize on these manifold advantages, and to explore alternative III-V compounds for additional potential improvements. The current status and future prospects for research and development in this area are reviewed and the progress being made toward development of GaAs cells suitable for variety of spače missions is discussed. Cell types under various stages of development include n(+)/p shallow homojunction thin film GaAs cells, x100 concentration ratio p/n and n/p GaAs small area concentrator cells, mechanically-stacked, two-junction tandem cells, and three-junction monolithic cascade cells, among various other cell types. Author

N85-21262*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DESIGN STUDY OF AN INTEGRATED AEROBRAKING ORBITAL TRANSFER VEHICLE
Carl D. Scott, Barney B. Roberts, Kornel Nagy, Peter Taylor, Joe D. Gamble, Christopher J. Ceremeli, Kenneth R. Knoll, Chien P. Li, and Robert C. Reid Mar. 1985 40 p refs
(NASA-TM-58264; S-542; NAS 1.15:58264) Avail: NTIS HC A03/MF A01 CSCL 22B

An aerobraking orbital transfer vehicle (AOTV) concept, which has an aerobrake structure that is integrated with the propulsion stage, is discussed. The concept vehicle is to be assembled in space and is space-based. The advantages of aeroassist over an all propulsive vehicle are discussed and it is shown that the vehicle considered is very competitive with inflatable and deployable concepts from mass and performance aspects. The aerobrake geometry is an ellipsoidally blunted, raked-off, elliptical wide-angle cone with a toroidal skirt. Propellant tanks, engines, and subsystems are integrated into a closed, isogrid aerobrake structure which provides rigidity. The vehicle has two side-firing, gimbaled RL-10 type engines and carries 38,000 kg of useable propellant. The trajectory during aerobraking is determined from an adaptive guidance logic, and the heating is determined from engineering correlations as well as 3-D Navier-Stokes solutions. The AOTV is capable of placing 13,500 kg payload into geosynchronous Earth orbit (GEO) or carrying a LEO-GEO-LEO round-trip payload of 7100 kg. A two-stage version considered for lunar missions results in a lunar surface delivery capability of 18,000 kg or a round-trip capability of 6800 kg with 3860 kg delivery-only capability. M.G.

N85-21263*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-VOLTAGE, HIGH-POWER, SOLID-STATE REMOTE POWER CONTROLLERS FOR AEROSPACE APPLICATIONS
John C. Sturman Mar. 1985 34 p refs
(NASA-TP-2437; E-2359; NAS 1.60:2437) Avail: NTIS HC A03/MF A01 CSCL 10B

Two general types of remote power controller (RPC) that combine the functions of a circuit breaker and a switch were developed for use in direct-current (dc) aerospace systems. Power-switching devices used in these designs are the relatively new gate-turnoff thyristor (GTO) and power metal-oxide-semiconductor field-effect transistors (MOSFET). The various RPC's can switch dc voltages to 1200 V and currents to 100 A. Seven different units were constructed and subjected to comprehensive laboratory and thermal vacuum testing. Two of these were dual units that switch both positive and negative voltages simultaneously. The RPC's using MOSFET's have slow turnon and turnoff times to limit voltage spiking from high di/dt. The GTO's have much faster transition times. All RPC's have programmable overload tripout and microsecond tripout for large overloads. The basic circuits developed can be used to build switchgear limited only by the ratings of the switching device used. Author

N85-22221*# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.
AN INVESTIGATION OF SPACE SHUTTLE MAIN ENGINE SHUTDOWN CHUGGING INSTABILITY
Paul E. George, II *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 36p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 21H

N85-22238*# Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
SOLID ROCKET MOTOR CASE (SRMC) DYNAMIC SENSITIVITY TO CHANGES IN COMPOSITE PROPERTIES
R. Noel Tolbert *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan.

1985 20p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 21H

N85-21201*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PARTICLE SIZE, NUMBER, COMPOSITION AND VELOCITY FROM SOLID ROCKET MOTORS
Barney B. Roberts *In its* Orbital Debris Mar. 1985 p 170-176
(For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 21H

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-21264*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPUTER SIMULATION OF THIN FILM NUCLEATION AND GROWTH: THE VOLMER-WEBER CASE
Joshua Salik and Hiren M. Ghose (Cuyahoga Community Coll.) 1985 12 p refs Proposed for presentation at the 12th Intern. Conf. on Met. Coatings, Los Angeles, 15-19 Apr. 1985; sponsored by the American Vacuum Society
(NASA-TM-86968; E-2493; NAS 1.15:86968) Avail: NTIS HC A02/MF A01 CSCL 07A

The computer simulation of thin film nucleation and growth, which was previously performed for the case of single monolayer, was modified to include multilayer growth via the Volmer-Weber mechanism. The simulation results show that: (1) the kinetics of multilayer film growth is nearly identical to that of monolayer growth; (2) when no reevaporation takes place, the cluster density resulting from multilayer growth is higher at high coverage than that resulting from monolayer growth; (3) when reevaporation does take place, the cluster density resulting from multilayer growth is nearly identical to that resulting from monolayer growth. This is not due, however, to similarity in microstructure. E.A.K.

N85-21265# Wyoming Univ., Laramie. Dept. of Chemistry.
A STUDY OF ORGANIC CHEMICAL REACTIONS IN MICRO-EMULSIONS Final Report, 10 Jun. 1981 - 31 Aug. 1984
David A. Jaeger 24 Oct. 1984 11 p
(Contract DAAG29-81-K-0100)
(AD-A150083; ARO-17842.9-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

This Final Report summarizes the work performed under the contract noted above. Three different aspects of the application of microemulsions in organic synthesis were investigated. The first involved a delineation of the ability of microemulsions to catalyze synthetically useful reactions of water-insoluble organic compounds with water-soluble inorganic reagents. The second aspect involved an identification of the reactive site for such reactions. The third encompassed the synthesis of destructible (cleavable) surfactants, a new class of surfactants specifically tailored for the use of microemulsions in organic synthesis. We also began the design and synthesis of turnover catalysts for carbon and phosphorus ester hydrolysis. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N85-21266* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL BARRIER COATING SYSTEM Patent
Stephan Stecura, inventor (to NASA) Issued 27 Nov. 1984 7 p Filed 16 Aug. 1983 Supersedes N83-34014 (21 - 22, p 3601) Continuation-in-part of abandonded US Patent Appl. SN-375784, filed 6 May 1982
(NASA-Case-LEW-13324-2; NAS 1.71:LEW-13324-2; US-Patent-4,485,151; US-Patent-Appl-SN-523297; US-Patent-Class-428-633; US-Patent-Class-428-656; US-Patent-Class-428-678; US-Patent-Class-428-679; US-Patent-Class-428-680; US-Patent-Class-428-681; US-Patent-Class-428-682; US-Patent-Class-428-683; US-Patent-Class-428-684; US-Patent-Appl-SN-375784) Avail: US Patent and Trademark Office CSCL 11D

A high temperature oxidation resistant, thermal barrier coating system is disclosed for a nickel cobalt, or iron base alloy substrate. An inner metal bond coating contacts the substrate, and a thermal barrier coating covers the bond coating. NiCrAlR, FeCrAlR, and CoCrAlR alloys are satisfactory as bond coating compositions where R=Y or Yb. These alloys contain, by weight, 24.9-36.7% chromium, 5.4-18.5% aluminum, and 0.05 to 1.55% yttrium or 0.05 to 0.53% ytterbium. The coatings containing ytterbium are preferred over those containing yttrium. An outer thermal barrier coating of partial stabilized zirconium oxide (zirconia) which is between 6% and 8%, by weight, of yttrium oxide (yttria) covers the bond coating. Partial stabilization provides a material with superior durability. Partially stabilized zirconia consists of mixtures of cubic, tetragonal, and monoclinic phases.
Official Gazette of the U.S. Patent and Trademark Office

N85-21267* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIAMONDLIKE FLAKES Patent
Bruce A. Banks, inventor (to NASA) Issued 22 Jan. 1985 6 p Filed 19 Mar. 1984 Supersedes N84-22696 (22 - 13, p 1953) Continuation-in-part of US Patent-4,437,962, US Patent Appl. SN-495381, filed 17 May 1983
(NASA-Case-LEW-13837-2; NAS 1.71:LEW-13837-2; US-Patent-4,495,044; US-Patent-Appl-SN-591089; US-Patent-Class-204-192C; US-Patent-Class-204-192R; US-Patent-Class-204-192N; US-Patent-Class-423-445; US-Patent-Class-423-446; US-Patent-Class-423-449; US-Patent-Class-427-39; US-Patent-4,437,962; US-Patent-Appl-SN-495381) Avail: US Patent and Trademark Office CSCL 11D

A carbon coating was vacuum arc deposited on a smooth surface of a target which was simultaneously ion beam sputtered. The bombarding ions have sufficient energy to create diamond bonds. Spalling occurs as the carbon deposit thickens. The resulting diamond like carbon flakes improve thermal, electrical, mechanical, and tribological properties when used in aerospace structures and components.
Official Gazette of the U.S. Patent and Trademark Office

N85-21268*# Rensselaer Polytechnic Inst., Troy, N. Y. School of Engineering.
COMPOSITE STRUCTURAL MATERIALS Semiannual Progress Report, 30 Apr. - 30 Sep. 1984
George S. Ansell, Robert G. Loewy, and Stephen E. Wiberley Dec. 1984 152 p refs Sponsored in part by AF
(Grant NGL-33-018-003)
(NASA-CR-175515; NAS 1.26:175515; SAR-47) Avail: NTIS HC A08/MF A01 CSCL 11D

Progress is reported in studies of constituent materials composite materials, generic structural elements, processing science technology, and maintaining long-term structural integrity. Topics discussed include: mechanical properties of high performance carbon fibers; fatigue in composite materials; experimental and theoretical studies of moisture and temperature effects on the mechanical properties of graphite-epoxy laminates and neat resins; numerical investigations of the micromechanics of composite fracture; delamination failures of composite laminates; effect of notch size on composite laminates; improved beam theory for anisotropic materials; variation of resin properties through the thickness of cured samples; numerical analysis composite processing; heat treatment of metal matrix composites, and the RP-1 and RP2 gliders of the sailplane project. A.R.H.

N85-21269*# Washington Univ., St. Louis, Mo. Lab. for Ultrasonics.
QUANTITATIVE NON-DESTRUCTIVE EVALUATION OF DAMAGE IN COMPOSITE MATERIALS USING TRANSMITTED AND REFLECTED ULTRASOUND Semiannual Progress Report, 15 Sep. 1984 - 15 Mar. 1985
James G. Miller 1985 40 p refs
(Grant NsG-1601)
(NASA-CR-175550; NAS 1.26:175550) Avail: NTIS HC A03/MF A01 CSCL 11D

The application of ultrasound for the nondestructive evaluation of advanced composite materials is summarized. Quantitative indices from fundamental acoustic parameters of the inhomogeneous materials were derived. The investigations into the estimation of the average attenuation from backscattered ultrasound are described. The use of a centroid-shift technique in inhomogeneous materials is reported and investigation into the use of the Wigner distribution for attenuation estimation is summarized. E.A.K.

N85-21270*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARACTERIZATION OF MODE 1 AND MIXED-MODE FAILURE OF ADHESIVE BONDS BETWEEN COMPOSITE ADHERENDS
S. Mall (Missouri Univ., Rolla) and W. S. Johnson Feb. 1985 27 p refs Presented at the 7th Symp. on Composite Mater. Testing and Design, Philadelphia, 2-4 Apr. 1984 Submitted for publication
(NASA-TM-86355; NAS 1.15:86355) Avail: NTIS HC A03/MF A01 CSCL 11D

A combined experimental and analytical investigation of an adhesively bonded composite joint was conducted to characterize both the static and fatigue beyond growth mechanism under mode 1 and mixed-mode 1 and 2 loadings. Two bonded systems were studied: graphite/epoxy adherends bonded with EC 3445 and FM-300 adhesives. For each bonded system, two specimen types were tested: a double-cantilever-beam specimen for mode 1 loading and a cracked-lapshear specimen for mixed-mode 1 and 2 loading. In all specimens tested, failure occurred in the form of debond growth. Debonding always occurred in a cohesive manner with EC 3445 adhesive. The FM-300 adhesive debonded in a cohesive manner under mixed-mode 1 and 2 loading, but in a cohesive, adhesive, or combined cohesive and adhesive manner under mode 1 loading. Total strain-energy release rate appeared to be the driving parameter for debond growth under static and fatigue loadings. Author

N85-21271*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ACCELERATED VISCOELASTIC CHARACTERIZATION OF T300-5208 GRAPHITE-EPOXY LAMINATES
M. E. Tuttle and H. F. Brinson Washington NASA Mar. 1985 234 p refs
(Contract NCC2-71)
(NASA-CR-3871; NAS 1.26:3871; VPI-E-84-9) Avail: NTIS HC A11/MF A01 CSCL 11D

A viscoelastic response scheme for the accelerated characterization of polymer-based composite laminates in applied to T300/5208 graphite/epoxy. The response of uni-directional specimens is modeled. The transient component of the viscoelastic creep compliance is assumed to follow a power law approximation. A recursive relationship is developed, based upon the Schapery single-integral equation, which allows approximation of a continuous time-varying uniaxial load using discrete steps in stress. The viscoelastic response of T300/5208 to transverse normal and shear stresses is determined unsing 90 deg and 10 deg off-axis tensile specimens. In each case the seven viscoelastic material parameters required in the analysis are determined experimentally using short-term creep and creep recovery tests. It is shown that an accurate measure of the power law exponent is crucial for accurate long-term prediction. A short term test cycle selection procedure is proposed, which should provide useful guidelines for the evaluation of other viscoelastic materials. Author

N85-21272*# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
NUMERICAL STUDY OF LARGE-EDDY BREAKUP AND ITS EFFECT ON THE DRAG CHARACTERISTICS OF BOUNDARY LAYERS Final Report
Robert B. Kinney, Mohammad E. Taslim, and Shi Chang Hung Mar. 1985 90 p refs
(Grant NAG1-141)
(NASA-CR-3884; NAS 1.26:3884) Avail: NTIS HC A05/MF A01 CSCL 11D

The break-up of a field of eddies by a flat-plate obstacle embedded in a boundary layer is studied using numerical solutions to the two-dimensional Navier-Stokes equations. The flow is taken to be incompressible and unsteady. The flow field is initiated from rest. A train of eddies of predetermined size and strength are swept into the computational domain upstream of the plate. The undisturbed velocity profile is given by the Blasius solution. The disturbance vorticity generated at the plate and wall, plus that introduced with the eddies, mix with the background vorticity and is transported throughout the entire flow. All quantities are scaled by the plate length, the unidsturbed free-stream velocity, and the fluid kinematic viscosity. The Reynolds number is 1000, the Blasius boundary layer thickness is 2.0, and the plate is positioned a distance of 1.0 above the wall. The computational domain is four units high and sixteen units long. R.J.F.

N85-21273*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR ANALYSIS FOR HIGH-TEMPERATURE MULTILAYERED FIBER COMPOSITE STRUCTURES M.S. Thesis
Dale A. Hopkins Aug. 1984 120 p refs
(NASA-TM-83754; E-2242; NAS 1.15:83754) Avail: NTIS HC A06/MF A01 CSCL 11D

A unique upward-integrated top-down-structured approach is presented for nonlinear analysis of high-temperature multilayered fiber composite structures. Based on this approach, a special purpose computer code was developed (nonlinear COBSTRAN) which is specifically tailored for the nonlinear analysis of tungsten-fiber-reinforced superalloy (TFRS) composite turbine blade/vane components of gas turbine engines. Special features of this computational capability include accounting of; micro- and macro-heterogeneity, nonlinear (stess-temperature-time dependent) and anisotropic material behavior, and fiber degradation. A demonstration problem is presented to mainfest the utility of the upward-integrated top-down-structured approach, in general, and to illustrate the present capability represented by the nonlinear COBSTRAN code. Preliminary results indicate that nonlinear COBSTRAN provides the means for relating the local nonlinear and anisotropic material behavior of the composite constituents to the global response of the turbine blade/vane structure. Author

N85-21274# Boston Univ., Mass. Dept. of Physics.
INVESTIGATION OF ELECTRIC AND MAGNETIC PROPERTIES OF INTERCALATED GRAPHITE Annual Report, 30 Sep. 1983 - 30 Sep. 1984
G. O. Zimmerman 15 Nov. 1984 24 p
(Grant AF-AFOSR-0286-82)
(AD-A149801; Rept-20-219-6340-5; AFOSR-84-1229TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

During the investigation of FeC13 intercalated graphite at this laboratory, several important discoveries were made about the electric and magnetic properties of these substances. It was found that in well characterized FeCl2 samples there was a magnetic susceptibility maximum indicating a magnetic transition at 6.5 K in stage one and at 1.72 K in stage two. At higher temperatures the magnetic susceptibility of these samples obeyed the Curie-Weiss law with the theta indicating an antiferromagnetic interaction within the layers and a ferromagnetic one between layers in stage one and antiferromagnetic interactions both within and between layers in stage two. GRA

N85-21275# Dayton Univ., Ohio. School of Engineering.
PRELIMINARY REVIEW OF STATISTICAL TREATMENT OF

S-GLASS/EPOXY STRESS RUPTURE DATA Final Report, Jun. 1983 - Jun. 1984
G. Shaughnessy and J. A. Snide Wright-Patterson AFB, Ohio Air Force Wright Aeronautical Labs. Sep. 1984 20 p
(Contract F33615-82-C-5039)
(AD-A149810; AFWAL-TR-84-4104) Avail: NTIS HC A02/MF A01 CSCL 11/4

The purpose of this report is to provide statistically derived tabular design data to predict the estimated stress rupture life of unidirectional E-glass/epoxy composites subjected to sustained tensile loading. The maximum likelihood estimated life (MLEL) is tabulated for various stress levels of the fiber and quantile level. The lower bound lifetime with confidence intervals of 95 and 99 percent are also tabulated for the various fiber stress and quantile levels. The estimated lifetimes were calculated from accelerated stress rupture tests of T. T. Chiao (Lawrence Livermore Laboratory) who used uniaxial strand samples; therefore, the estimated lifetimes reported are considered to be conservative.
GRA

N85-21276# Boston Univ., Mass. Dept. of Physics.
ELECTRIC AND MAGNETIC PROPERTIES OF INTERCALATED GRAPHITE Annual Scientific Report, 30 Sep. 1982 - 30 Sep. 1983
G. O. Zimmerman 15 Nov. 1984 13 p
(Grant AF-AFOSR-0286-82)
(AD-A149848; Rept-20-219-6340-5; AFOSR-84-1231TR) Avail: NTIS HC A02/MF A01 CSCL 08/7

Graphite intercalated compounds proved to be a particularly fertile system on which to study phase transitions. In the case of FeCl3 intercalated graphite as well as the in-plane densities and defects play an extremely important role, and add to the variety of critical phenomena to be observed. The investigation so far has yielded many interesting results on well characterized samples. We have studied the magnet properties of our samples as a function of defects, probed by the Mossbauer technique, in-plane densities of the intercalant, and stage. Scientifically, the interest is in the nature of these transitions and their comparison to the various models such as the x-y model, the Potts model and various other models, such as a spin glass, which predict anomalies in two dimensional systems which in the lower stages might become three dimensional in character.
GRA

N85-21277# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
TEMPERATURE RESPONSES OF COMPOSITE PANELS Final Report, Jun. 1983 - May 1984
Lit S. Han Wright Patterson AFB, Ohio AFWAL Sep. 1984 93 p
(Contract F33615-83-C-3000; AF Proj. 2401)
(AD-A150053; AFWAL-TR-84-3056) Avail: NTIS HC A05/MF A01 CSCL 11/4

In this report, two transient heat conduction problems for application to the thermal evaluation of composite materials are analyzed and discussed. The purposes of these two analyses are at least two fold: One is to demonstrate by detailed numerical results that composite materials with a larger in-plane thermal conductivity than the transverse value exhibit lower surface temperatures when the thermal loading consists of irradiation by a concentrated cylindrical beam. Effective radial heat spread along the in-plane direction serves to reduce local heat accumulation and thereby mitigates heat-spot temperature rises. Accordingly, preventing or delaying damage due to high-intensity thermal radiation on composite surfaces can be enhanced by using materials with large in-plane thermal conductivities. The second objective of the investigation is to develop a methodology whereby composite panels undergoing cyclic heating and cooling can be analyzed for their periodic temperature responses. This is particularly important for determining thermal stresses resulting from alternating temperature fluctuations. The methodology developed is especially useful since numerical approaches can be very time-consuming and unreliable.
GRA

N85-21278# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
WAVECODE CONSTITUTIVE MODELS: NONHOMOGENEOUS MIXTURES
D. S. Drumheller Nov. 1984 24 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000836; SAND-84-0713) Avail: NTIS HC A02/MF A01

A one-dimensional theory for spatially nonhomogeneous mixtures composed of up to four constitutents with void was considered. The implementation of this model into a one-dimensional Lagrangian wavecode is also discussed. Example calculations for an isentropic compression wave generated by a material fabricated from tantalum, copper, aluminum, and polyolefin powders are given. The initial development of this model was in support of high-pressure (> 100 Gpa) equation of state studies.
DOE

N85-21466# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Recherches Aerospatiales.
INFRARED MATERIAL OPTICAL DAMAGE BY RAIN
A. Deom, G. Gauffre, and D. L. Balageas *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 207-213 Original language document was announced in IAA as A84-45206 (For primary document see N85-21444 12-32)
(AD-P004372) Avail: NTIS HC A12/MF A01 CSCL 20/6

N85-22213*# Georgia Inst. of Tech., Atlanta. School of Mathematics.
INVESTIGATION OF THE EFFECTS OF NaOH DOPANT LEVEL ON THE PHYSICAL AND MECHANICAL PROPERTIES OF CARBON/PHENOLIC COMPOSITE MATERIAL
Raymond G. Clinton, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 35 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11D

N85-22214*# Tennessee Technological Univ., Cookeville. Dept. of Chemistry.
SILICON CARBIDE-SILICON NITRIDE FIBERS: PREPARATION AND CHARACTERIZATION OF POLYCARBOSILAZANE PRECURSORS
David J. Crouse *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-21279* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD AND APPARATUS FOR MAPPING THE DISTRIBUTION OF CHEMICAL ELEMENTS IN AN EXTENDED MEDIUM Patent
Larry G. Evans (Computer Sciences Corp., Greenbelt, Md.) and Jacob I. Trombka, inventors (to NASA) (Computer Sciences Corp., Greenbelt, Md.) Issued 20 Nov. 1984 11 p Filed 31 Jan. 1983 Supersedes N83-20446 (21 - 10, p 1567) Sponsored by NASA (NASA-Case-GSC-12808-1; NAS 1.71:GSC-12808-1; US-Patent-4,483,817; US-Patent-Appl-SN-462497; US-Patent-Class-376-159) Avail: US Patent and Trademark Office CSCL 07D

Contaminants in an extended medium such as the wall of a building are mapped by locating neutron excitation source on one side of the wall and a gamma ray spectrometer, including a gamma

ray detector on the opposite side of the wall facing the excitation source. The source and detector are moved in unison in discrete steps over opposing wall surfaces so as to determine the chemical composition of the elements in a hemispheric region of the wall adjacent the detector with the radius of the region being substantially that of the mean free path distance of gamma rays emitted from elements interacting with neutrons on the detector side of the wall. The source and detector are reversed for relatively thick walls for mapping the distribution of elements on the other side of the wall thickness. The output of the detector is fed to a multichannel pulse height analyzer where the intensity of the various gamma ray spectral lines are indicated relative to a dominant constituent element such as silicon. Resolution of anomalies such as the presence of voids and/or determining the bulk density of the medium is achieved by substituting a gamma ray source technique is also applied to metal alloys, such as iron alloys, in either the solid or molten state.

Official Gazette of the U.S. Patent and Trademark Office

N85-21280* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PROCESS FOR PRODUCING TRIS S(N-METHYLAMINO) METHYLSILANE Patent

Johnny M. Clemons, Benjamin G. Penn, and Frank E. Ledbetter, III, inventors (to NASA) Issued 2 Oct. 1984 5 p Filed 9 May 1983 Supersedes N83-25811 (21 - 15, p 2364)
(NASA-Case-MFS-25721-1; NAS 1.71:MFS-25721-1; US-Patent-4,474,975; US-Patent-Appl-SN-492964; US-Patent-Class-556-410) Avail: US Patent and Trademark Office CSCL 07D

A method of producing tris (N-methylamine) methylsilane is described including the steps of forming and cooling a liquid solution of methylamine in an inert solvent and under an inert atmosphere at a temperature of about -30 C and slowly adding a quantity of methyltrichlorosilane while maintaining said temperature. The reaction mixture is then heated for about 60 minutes at a temperature of about 40 C, followed by filtering the solid portion from the liquid portion. The liquid is distilled to remove the solvent, resulting in a high yield of tris (N-methylamine) methylsilane.

Official Gazette of the U.S. Patent and Trademark Office

N85-21281 Department of the Navy, Washington, D. C.

A METHOD FOR DETERMINING IN SITU THE ABSORPTION COEFFICIENT OF PARTICULATE MEDIA USING PULSED LASER TECHNIQUE Patent

G. C. Mooradian and L. B. Stotts, inventors (to Navy) Issued 9 Oct. 1984 7 p Supersedes AD-D007049
(AD-D011548; US-Patent-4,475,816; US-Patent-Appl-SN-121937; US-Patent-Class-356-437) Avail: US Patent and Trademark Office CSCL 07/4

A true indication of a fluid's absorption coefficient takes into effect the contributing factors of absorption and particle multiple scattering. A pulsed optical source transmits radiation through a relatively large volume of a certain particulate fluid medium. A detector or irradiance meter is gated so as to provide waveforms on a monitor which are characteristic of the absorption and multiple scattering of the medium. Using the transmittance and multiple line spread of the received signal a nearly real-time in situ analysis can be performed to provide scientists, communications specialists, etc. with the capability to anticipate operational parameters. GRA

N85-21282# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.

ON THE COUPLING OF AN ANCHORED FLAME WITH AN ACOUSTIC FIELD

A. C. McIntosh Oct. 1984 24 p refs
(Coll-Aeron-8434; ISBN-0-947767-06-1) Avail: NTIS HC A02/MF A01

The interaction of an anchored flame with a low-level acoustic field is considered. The flame is considered to be held by a gauze through which the reactants are allowed to flow. Small perturbations in velocity in the combustion zone are linked upstream and downstream with order O(M) acoustic disturbances at large distances from the source, (where M is the flow Mach number). This matching process yields a frequency condition governing the flame vibration and preliminary results for emitted acoustic waves are presented. Author

N85-21283*# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.

BEHAVIOR OF THE LEAN METHANE-AIR FLAME AT ZERO-GRAVITY Final Report, Nov. 1983 - Dec. 1984

Kurt A. Noe and Roger A. Strehlow Feb. 1985 48 p refs
(Contract NCC3-35)
(NASA-CR-175586; NAS 1.26:175586; AAE-85-2; UILU-ENG-85-0502) Avail: NTIS HC A03/MF A01 CSCL 21B

A special rig was designed and constructed to be compatible with the NASA Lewis Research Center Airborne Research Laboratory to allow the study of the effect of gravity on the behavior of lean limit in a standard 50.4 mm (2 in.) internal diameter tube when the mixtures are ignited at the open end and propagate towards the closed end of the tube. The lean limit at zero gravity was found to be 5.10% methane and the flame was found to extenguish in a manner previously observed for downward propagating flames at one g. It was observed that g-jitter could be maintained at less than + or 0.04 g on most zero g trajectories. All of propagating lean limit flames were found to be sporadically cellularly unstable at zero g. There was no observable correlation between the occurrence of g-jitter and the lean limit, average propagation speed of the flame through the tube or the occurrence of cellular instability. B.W.

N85-21284# State Univ. of New York, Buffalo. Dept. of Chemistry.

ELECTROCHEMISTRY AND ELECTROCHEMICAL METHODOLOGY IN MOLTEN SALTS Final Report, 1 Oct. 1980 - 31 Aug. 1984

R. A. Osteryoung and J. G. Osteryoung 30 Nov. 1984 30 p
(Grant AF-AFOSR-0007-81)
(AD-A149613; AFOSR-80-1186TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

This work involved chemical and electrochemical studies in ambient temperature ionic liquids composed of either N-1-butylpyridinium chloride (BuPyCl) or 1-methyl-3-ethylimidazolium chloride (ImCl) mixed with aluminum chloride. Part of the work involved studies of solute chemistry and electrochemistry in these solvents. A portion of the work involved studies related to properties of the solvent systems. Work was also initiated in studies of polymer electrodes in these molten salt systems. GRA

N85-21285# California Univ., Los Angeles.

THE SYNTHESIS, STRUCTURAL CHARACTERIZATION AND REACTIONS OF CLOSO-RHODACARBORANE ANIONS CONTAINING A FORMAL d8 METAL VERTEX 1,2 Interim Report

J. A. Walker, C. B. Knobler, and M. F. Hawthorne 20 Nov. 1984 58 p
(Contract N00014-76-C-0390)
(AD-A149640; TR-124) Avail: NTIS HC A04/MF A01 CSCL 07/4

Deprotonation of three neutral closo- hydrido complexes (L)2-H-RhC2B9H11) under carefully controlled reaction conditions yields the corresponding isomeric (closo-L2RhC2B9H11)- species. Two of these have been structurally characterized: K(18-crown-6)(closo-3,3-(PPh3)2-3,1,2-RhC2B9H11).C4H8O.H2O, 2a, (Me4N)(closo-2,2-(PPh3)2-2,1,7-RhC2B9H11), 2b. Salts of 2a, 2b, and (closo-2,2-(PPh3)2-2,1,12-RhC2B9H11)-, 2c were treated with dilute mineral acids in ethanol to produce the neutral hydrido-closo complexes and with pi-acceptor ligands L = CO or C2H4 to produce the corresponding (closo-(PPh3)(L)-RhC2B9H11) salts.

Author (GRA)

N85-21286# Washington State Univ., Pullman. Chemical Physics Program.

MAGNETICALLY-INDUCED LUMINESCENCE OF (Ir(2=PHOS)(2)C10(4) Interim Technical Report

T. J. Johnson, S. D. Phillips, and G. A. Crosby 15 Jan. 1985

14 p Submitted for publication
(Contract N00014-83-K-0609; NR Proj. 051-848)
(AD-A149659; TR-1-ONR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The intense luminescence of (Ir(2 double bond phos)2C104(2 double bond phos is cis-1,2-bis-(diphenylphosphino)ethylene) in a rigid glass matrix at 9.5 K was monitored while external magnetic fields (B sub max. = 6.7 Tesla) were applied. Radiative coupling to the ground state from a forbidden component was induced by the field. GRA

N85-21287# IBM Research Lab., San Jose, Calif.
NOVEL PHOTO-THERMAL TECHNIQUE FOR FLOW AND SPECTROSCOPIC MEASUREMENTS IN A DENSE AEROSOL STREAM
H. Sontag, I. Hussla, and A. C. Tam 28 Dec. 1984 13 p
(Contract N00014-83-C-0170)
(AD-A149745; TR-16) Avail: NTIS HC A02/MF A01 CSCL 07/4

A pulsed pump beam provides photo-thermal labelling of flowing aerosols and vapors. The labeling is detected by transient refraction or Mie scattering variations in a displaced probe beam, providing a new technique for flow and spectroscopic measurements. GRA

N85-21288# IBM Research Lab., San Jose, Calif.
CARBON MONOXIDE ADSORPTION ON A PLATINUM ELECTRODE STUDIED BY POLARIZATION MODULATED FT-IRRAS (FOURIER TRANSFORM-IR REFLECTIONS ADSORPTION SPECTROSCOPY). PART 1: CO ADSORBED IN THE DOUBLE LAYER POTENTIAL REGION AND ITS OXIDATION IN ACIDS
K. Kunimatsu, W. G. Golden, H. Seki, and M. R. Philpott Nov. 1984 27 p
(Contract N00014-82-C-0583)
(AD-A149751; TR-8) Avail: NTIS HC A03/MF A01 CSCL 07/4

Carbon monoxide adsorbed on a smooth platinum electrode was investigated in the potential range including the double layer region and the region of its steady state oxidation in solutions of 1M HClO4, H2SO4 or HCl using in situ polarization modulated Fourier transform - IR reflection absorption spectroscopy (FT-IRRAS). The intensity, position and linewidth of the IR absorption band of the linearly adsorbed CO species were measured as a function of potential. The evolution of carbon dioxide produced by the oxidation of the adsorbed CO was observed in situ by monitoring the IR absorption spectrum of the carbon dioxide. Oxidation of the adsorbed CO is completed before the formation of a surface oxide or an adsorbed oxygen layer. It was found that the linear increase of the CO stretching frequency continued even into the CO oxidation potential region where the coverage of CO decreases appreciably. It is concluded that oxidation proceeds mostly at the edges of CO islands where the water molecules are adsorbed adjacent to the CO sites. The band due to CO adsorbed in the bridged form was observed in 1M HClO4 by electrochemically modulated IR reflection spectroscopy (EMIRS) and it was concluded from its potential dependence that the bridged CO oscillator strength decreased at more positive potentials. GRA

N85-21289# Army Fuels and Lubricants Research Lab., San Antonio, Tex.
A BRIEF REVIEW OF THE TECHNOLOGY OF MICROEMULSIONS AND OTHER MICELLAR SYSTEMS Interim Report, 21 Mar. 1983 - 31 Dec. 1984
H. F. Hamil, G. E. Fodor, and W. D. Weatherford, Jr. Dec. 1984 50 p
(Contracts DAAK70-85-C-0007; DAAK70-82-C-0001; DA Proj. 1L1-61102-AH-51)
(AD-A149759; AFLRL-183) Avail: NTIS HC A03/MF A01 CSCL 07/4

The literature on micellar systems has been reviewed, and this report summarizes the results. The formation and characteristics of microemulsions, micellar solutions, liquid crystals, association polymers, etc., are discussed, and mechanisms and properties of emulsifers are reviewed. Basic studies of emulsifier chemistry for water-in-fuel microemulsions and association polymers for antimist fuels are being conducted in this laboratory. GRA

N85-21290# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
HETEROCONTACT EFFECTS IN POINT CONTACT ELECTRON-PHONON SPECTROSCOPY OF THE ALKALI METALS
H. U. Baranger, A. H. MacDonald, and C. R. Leavens 15 Dec. 1984 43 p
(Contract N00014-82-K-0576)
(AD-A149760; TR-6) Avail: NTIS HC A03/MF A01 CSCL 07/2

For a small contact between two different materials (a heterocontact), we derive the free electron expression for the electron-phonon spectral function determined from the measured I-V characteristic. The heterocontact spectral function differs strikingly from the homocontact spectral function in that it excludes scattering through angles less than a minimum angle in the larger bandwidth material. We calculate realistic heterocontact spectra for pairs of alkali metals. If in a given pair of alkalis the smaller bandwidth material is replaced by one with a still smaller bandwidth, the size of the signal from the larger bandwidth material decreases (sometimes dramatically), and the part of the spectrum due to scattering by 2k sub F phonons is relatively enhanced. Author (GRA)

N85-21291# Auburn Univ., Ala. Dept. of Chemistry.
AN INFRARED STUDY OF THE DISSOCIATION OF CARBON DIOXIDE OVER SUPPORTED RHODIUM CATALYSTS
M. A. Henderson and S. D. Worley 7 Jan. 1985 14 p
(Contract N00014-83-K-0637)
(AD-A149813; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

An infrared study has been performed concerning the possible dissociation of CO2 on supported Rh catalyst films. The data indicate that CO2 does dissociate on Rh/TiO2 and Rh/Al2O3 to form a carbonyl hydride species in accord with the work of Solymosi. This dissociation process is considerably enhanced by the presence of a small amount of hydrogen gas, but will proceed in the absence of hydrogen gas with the assistance of hydrogen migration from the support. Impurity boron also enhances the formation of the carbonyl hydride species, and hence CO2 dissociation, when it is present in the supported Rh films. GRA

N85-21292# SRI International Corp., Menlo Park, Calif.
TWO-DIMENSIONAL MEASUREMENTS OF OH CONCENTRATION AND TEMPERATURE IN REACTIVE FLOWS Final Report, Jul. 1981 - Mar. 1984
M. J. Dyer and D. R. Crosley Wright-Patterson AFB, Ohio Air Force Wright Aeronautical Labs. 5 Dec. 1984 39 p
(Contract F33615-81-K-2033)
(AD-A149849; AFWAL-TR-84-2045) Avail: NTIS HC A03/MF A01 CSCL 21/2

This report describes two related efforts that have as a common objective the development of new aspects of laser-induced fluorescene for measurements in time-varying reactive flows such as turbulent flames. The first effort was the demonstration, development and study of two-dimensional fluorescence imaging in flames. This provides a spatially correlated map of the concentration of OH radicals from a single laser shot. The second effort was the development of vibrational transfer thermometry, in which upward collisional energy transfer in the A2+ state of laser excited OH in flames is used to measure temperature simultaneously with OH concentration. Although a good correlation (better than 5 per cent rms deviation) between measured intensities and temperature was obtained in the range 1400-2700K, it has not been possible thus far to place the method on a sound fundamental, theoretical footing. GRA

N85-21293# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials.
STUDIES OF SILICON-REFRACTORY METAL INTERFACES: PHOTOEMISSION STUDY OF INTERFACE FORMATION AND COMPOUND NUCLEATION Final Report, 15 Apr. 1983 - 30 Sep. 1984

John H. Weaver 29 Oct. 1984 99 p
(Contract DAAG29-83-K-0061)
(AD-A150075; ARO-20577.5-PH) Avail: NTIS HC A05/MF A01 CSCL 11/2

The overall goal in this project was to examine the electronic and morphological interactions which occur at interfaces involving Si and metal overlayers. During the course of this project, we examined overlayers of Cr, Ti, Sm, Au, Ca, Ce, and Cu using photoelectron spectroscopy, Auger spectroscopy and LEED. A new technique involving angle-resolved Auger profiling was developed to determine the atomic density profile for interfaces. Its utility was demonstrated through studies of Cu/Si, Au/Si, and Ce/Si. Exhaustive use of synchrotron radiation photoemission has lead to a detailed understanding of the electronic bonding of silicides and metal/silicon interfaces. Collaborative studies with theorists gave rise to modeling of interfaces and calculation of electronic energy states for ordered silicides. GRA

N85-21294# IBM Research Lab., San Jose, Calif.
THE EFFECT OF XE UNDERLAYERS ON THE SURFACE ENHANCED RAMAN SCATTERING OF PYRIDINE ON COLD SILVER
H. Seki, T. J. Chuang, M. R. Philpott, E. V. Albano (Munich Univ.), and K. Wandelt (Munich Univ.) Nov. 1984 14 p
(Contract N00014-82-C-0583)
(AD-A150109; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Recently it has been proposed based on thermal desorption, electron spectroscopy and work function measurements that extremely small pores and cavities in silver films deposited at temperatures below 150K are the location of active sites for surface enhanced Raman scattering. The experiment reported here is an attempt to demonstrate in a more direct way that these cavities are responsible for the observed enhanced Raman scattering. It is shown that by filling these cavities with Xe atoms the enhancement effect on deposited pyridine can be dramatically reduced. GRA

N85-21295# IBM Research Lab., San Jose, Calif. Research Div.
PHOTO-THERMAL DETECTION OF THE ONSET OF PHOTOCHEMICAL NUCLEATION (LASER-SNOW) IN VAPOR
A. C. Tam, I. Hussla, and H. Sontag 28 Dec. 1984 14 p To be presented at the Conf. on Laser and Electro-Optic (CLEO), Baltimore, May 1985
(Contract N00014-83-C-0710; NR Proj. 633-844)
(AD-A150111; TR-15) Avail: NTIS HC A02/MF A01 CSCL 07/5

The phenomenon of photochemical nucleation of particles (also called Laser-snow) has been observed by many workers, for example, in metal vapor systems and in organic vapors. Although this laser-snow effect seems to occur generally under the right excitation, temperature and pressure conditions, the phenomenon remains poorly understood. One problem is a lack of method for detecting the onset of photo-nucleation of particles, which has up to now been detected, e.g., by light-scattering, or electrostatic deflection. We believe that photo-nucleation should result in a large amount of heat released at the excitation laser beam, due, for example, to heat of condensation, and hence should be detectable by noncontact photothermal means. We report here a first experiment for such detections by using Thermal Lensing (TL) and by Optoacoustic Laser-beam Deflection (OLD). The present experiment is performed in a carbon disulphide vapor at room temperature and reduced pressures. GRA

N85-21296# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
SOLID ELECTROLYTES: MECHANISMS FOR ACHIEVING OPTIMAL CONDUCTIVITY Final Report, 15 Oct. 1981 - 14 Oct. 1984
Mark A. Ratner and A. Nitzan 30 Nov. 1984 26 p
(Grant DAAG29-82-K-0007)
(AD-A150116; ARO-18439.12-CH) Avail: NTIS HC A03/MF A01 CSCL 07/4

In an attempt to understand mobility mechanisms, to predict optimal conduction conditions for solid electrolytes, and to develop methods for calculating conductivity in a classical many-body systems, calculations have been completed for a variety of one-, two-, and three-dimensional model lattice systems. These calculation involve Monte-Carlo simulation, self-consistent-field techniques, and reduced Langevin dynamics, and have been devoted to the actual calculation of the frequency-dependent conductivity tensor sigma omega, and of its variation with important experimental variables (concentration, pressure, temperature, trap sites, identify of mobile ion, lattice geometry). The ambition of this research has been to provide hard numerical data for three purposes: understanding and prediction of the effects of variation of external parameters (temperature, doping, compensation, ion exchange) on conductivity, comparison of good numerical data with extant formal theory to focus on the most important variables or achieving optimal conductivity, and development of a mechanistic model (including such extremes as hopping and liquid-like diffusion) to correlate the behaviors of a large number of framework conductors. GRA

N85-21297# AeroChem Research Labs., Inc., Princeton, N. J.
IONIC MECHANISMS OF SOOT FORMATION IN FLAMES Final Report, 1 Apr. 1981 - 31 Jul. 1983
Hartwell F. Calcote and Douglas B. Olson May 1984 31 p
(Contract F49620-81-C-0030; AF Proj. 2308)
(AD-A150119; AEROCHEM-TP-443; AFOSR-84-1208TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The chemi-ion, ion-molecule mechanism of soot nucleation has been further examined by studies in premixed flames with Langmuir probes, molecular beam ion sampling mass spectrometry, and by flame temperature measurements. Langmuir probes were used to obtain absolute total ion concentrations in acetylene-oxygen flames over a range of equivalence ratios extending from stoichiometric mixtures to very sooty flames. These data were used in a preliminary calibration of the mass spectrometer. Two peaks in both total and individual positive ion concentration profiles were identified preceding the appearance of soot - the second peak occurred only at equivalence ratios very near the soot point or in sooty flames. The peak ion concentration decreased with increasing equivalence ratio well beyond the threshold equivalence ratio for soot formation. This refutes one of the arguments that has been used against the proposed mechanism, namely that ion concentrations increase at the equivalence ratio for soot formation. Means of treating particle electronics involved in sooty flames have been organized and applied to explain the effect of chemical additives on soot production. The effect of flame temperature (1700 to 2400 K) on soot threshold and soot yield was determined for a series of fuels. Increasing flame temperatures increased the soot threshold equivalence ratio with small temperature dependence, and decreased the soot volume fraction with a large temperature dependence. The results continue to support the chemi-ion, ion-molecule mechanism of soot nucleation. GRA

N85-21298# New Orleans Univ., La. Dept. of Chemistry.
ELECTROSTATIC POTENTIALS: A NEW METHOD FOR INTERPRETING AND PREDICTING MOLECULAR REACTIVITIES AND FOR DESIGNING SYNTHETIC PATHWAYS. APPLICATIONS TO NITROAROMATICS, NITRAMINES AND NITRATED Final Report, 1 Aug. 1981 - 30 Sep. 1984
Peter Politzer 24 Nov. 1984 23 p
(Contract DAAG29-81-K-0155)
(AD-A150120; ARO-18124.7-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The general objectives of this research program have been the determination and prediction, computationally, of the reactive behavior of high-energy molecules and related species, such as intermediates in syntheses. This has involved introducing certain new concepts and techniques, as well as extending the range of applicability of older, established procedures. For instance, one of our aims was to develop a means whereby molecular electrostatic potentials, a very effective tool for elucidating electrophilic reactions, could also be applied to nucleophilic processes. We have sought to achieve a better understanding of the basic factors

that determine the reactive properties of certain important classes of high-energy molecules (including nitroaromatics and nitramines) and how these would be altered by various possible modifications of these molecules. One of our specific aims throughout this work has been the development of a greater degree of insight into the factors governing the stabilities of the compounds of interest, and how these stabilities are affected by, for example, various substituents on the molecules. GRA

N85-21299# Sandia Labs., Albuquerque, N. Mex.
HYDROGEN FLAME ACCELERATION AND TRANSITION TO DETONATION
M. P. Sherman 1984 20 p refs Presented at the 12th Water Reactor Safety Res. Inform. Meeting, Gaithersburg, MD, 23 Oct. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000611; SAND-84-2078C; CONF-8410142-17) Avail: NTIS HC A02/MF A01

The results obtained from two large experimental facilities are described. The flame acceleration measurements and experiments (FLAME) is a large horizontal rectangular channel designed to study flame acceleration, transition to detonation, simulation of combustion in containment geometries, component heating, and other problems in hydrogen combustion relevant to reactor safety. The heated detonation tube was designed to study detonation is in hydrogen-air-steam mixtures. DOE

N85-21300# Brookhaven National Lab., Upton, N. Y.
ALTERNATIVE ANODIC REACTIONS IN WATER SPLITTING Final Report
O. J. Murphy and J. OM. Bockris Oct. 1984 112 p refs
(Contract DE-AC02-76CH-00016)
(DE85-004159; BNL-35458) Avail: NTIS HC A06/MF A01

An anodic depolarization path to hydrogen production through water electrolysis was examined, using lignite, grass and household wastes. Cyclic voltammograms showed peaks arising from dissolved organics. Increase of temperature produced more peaks. In alkaline solution, peaks disappeared. Oxidation currents were three times greater if the lignite particles were in contact with the electrode compared with their absence from solution. Platinum anodes oxidized lignite better than PbO2. Redox systems, added to the electrolyte, helped compound formation. Grass and household wastes gave similar results but lower oxidation currents. Compounds present in solution prior to electrolysis dissolve off the internal surfaces of lignit particles. Increased oxidation currents, caused when lignite particles came in contact with the anode, arose, not because of enhanced electrochemical reactions, but from enhanced lignite dissolution following erosion. The organic compounds eventually form CO2. The hydrocarbons are formed via a Kolbe mechanism from carboxylic acids. Speculative economic considerations show that the final cost of hydrogen produced, using lignite as an anode depolarizer, is considerably cheaper than that from natural gas. DOE

N85-21301# SRI International Corp., Menlo Park, Calif.
ADSORPTION THERMODYNAMICS AND SURFACE TRANSPORT OF METAL CATALYST POISONS Annual Report
Henry Wise 22 Oct. 1984 7 p ref
(Contract DE-AT03-77ER-71128)
(DE85-003750; DOE/ER-71128/T1) Avail: NTIS HC A02/MF A01

Equilibrium studies of sulfur chemisorption were extended to halogen chemisorption on dispersed metal catalysts. Also, a series of measurements was initiated on the adsorption of sulfur and carbon and their interaction on single-crystal transition metals. The relationship between binding energy and activation energy for surface diffusion is being examined by evaluating the diffusion coefficient for sulfur adatom diffusion on single crystal metals as a function of surface coverage, surface orientation, and temperature. DOE

N85-21302# Air Products and Chemicals, Inc., Allentown, Pa.
STUDY OF THE KINETICS OF HYDROGENATION USING AGED CATALYSTS Quarterly Technical Progress Report, 1 Jan. - 30 Jun. 1984
Frank K. Schweighardt Jul. 1984 51 p refs
(Grant DE-FG22-83PC-60783)
(DE85-004373; DOE/PC-60783/3) Avail: NTIS HC A04/MF A01

Final approval to operate the autoclave is anticipated. Analytical procedures were developed to quantify feed and reaction products. Capillary gas chromatography methods using a 21 component standard blend of hydrocarbon showed an overall retention time precision of + or - 0.002 minutes relative to naphthalene (19. 707 minutes) over a range of 1 to 50 minutes. Response factors to quantify weight percent of each component show a precision of + or - 0.02 absolute from .1 to 10%, with an accuracy of + or - 0.01% at approx. 5 wt%. DOE

N85-21303# Northwestern Univ., Evanston, Ill. High Pressure and Catalytic Lab.
PROPERTIES OF SUPPORTED METAL CATALYSTS Final Report
John B. Butt, Robert L. Burwell, Jr., and J. B. Cohen 1984 55 p
(Contract DE-AC02-77ER-04254)
(DE85-003927; DOE/ER-04254/6) Avail: NTIS HC A04/MF A01

All catalysts were investigated by WAXS as a function of pretreatment and some by SAXS. Studies of EXAFS and some studies of WAXS were performed. The hydrogenolysis of methylcyclopropane and the isotopic exchange between cyclopentane and deuterium were studied on all catalysts and the hydrogenation of propylene and the isotopic exchange between deuterium and neohexane were studied on Pt/SiO2 and Pd/SiO2. Detailed studies were made of the reaction of oxygen with reduced catalysts and of hydrogen with oxidized catalysts. DOE

N85-21304# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
MILLIMETER WAVE DIELECTRIC PROPERTY MEASUREMENT OF GYROTRON WINDOW MATERIALS Technical Progess Report, 26 Jan. 1983 - 29 Feb. 1964
W. W. Ho Apr. 1984 55 p refs
(Contract DE-AC05-84OR-21400)
(DE85-004430; ORNL/Sub-83-51926/1; SC5357.2TR) Avail: NTIS HC A04/MF A01

The millimeter wave dielectric properties of various single crystal and ceramic materials and coolant fluids were determined in order to assess their transmission properties for high power gyrotron window applications. Chemical and microstructural analyses were carried out for identifying the key materials parameters controlling the millimeter absorption in these materials in support of future advanced materials development efforts. DOE

N85-21305# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTROCHEMICAL PROCESSES AT THE SODIUM (BETA)" ALUMINA INTERFACE
C. C. Mailhe May 1984 76 p refs
(Contract DE-AC03-76SF-00098)
(DE85-004653; LBL-17687) Avail: NTIS HC A05/MF A01

The influences of some impurities including oxygen, calcium and potassium on the polarization at the interface Na/(BETA) prime prime alumina, were studied using a Na/Na cell. At 350 C, the normal operating temperature of the battery and at low current density (30 to 40 mA/cm(2)) voltammetry indicated Ohmic interface behavior. Deviations from this behavior occurred only for higher current densities (100 to 150 mA/cm(2)) and were accentuated at low temperature (160 C). Oxygen contamination caused an increase in resistance for sodium flowing in the (BETA) prime prime alumina, this effect was explained by a pile-up at the interface of the oxygen present in the sodium and eventually formation of an oxide film, whereas the decrease in resistance associated with fresh sodium flowing out of electrolyte could be attributed to a resultant decrease in oxygen concentration. The addition of vanadium to the sodium decreased the cell resistance. Vanadium is believed to reduce the oxide layer present at the surface of the (BETA) prime prime A1203. Surprisingly, the addition of CaO, CaC12, Ca or KC1,

which were expected to increase significantly the cell resistance did not result in such effects. DOE

N85-21306# Oklahoma Univ., Norman.
VAPOR PRESSURE STUDIES OF THE SOLUBILIZATION OF HYDROCARBONS BY SURFACTANT MICELLES Quarterly Report, 1 Jul. - 30 Sep. 1984
S. D. Christian and E. E. Tucker 1984 5 p refs
(Contract DE-AT19-81BC-10476)
(DE85-004319; DOE/BC-10476/11) Avail: NTIS HC A02/MF A01

The objectives were to obtain accurate thermodynamic information about the solubilization of hydrocarbons and polar derivatives of hydrocarbons by surfactant solutions. Several aqueous surfactant systems, including sodium octylsulfate, sodium octylbenzenesulfonate, and cetylpyridirium chloride, were investigated with vapor pressure, surface tension, ion activity, and osmometery methods. The analysis of solubilization results for the system sodium octylsulfate/NaCl/benzene/water has been completed, and results summarized. The mathematical analysis of the precise vapor pressure data for this system was performed to correlate all the results with a mass action, modified Poisson distribution model developed. The vapor pressure data for the system at 15, 25, 35, and 45(0) C are fitted by the model to a root mean square deviation in dissolved benzene concentration of approximately 0.00001 M in each case. Partial pressure of benzene, n-buutanol, n-pentanol, and n-hexane have been determined for solutions of cetylpyridinium chloride (CPC) at several CPC concentrations at 25(0) C. DOE

N85-21307# Missouri Univ., Rolla.
CHARACTERIZATION OF HIGH TEMPERATURE ELECTRICALLY CONDUCTING OXIDES
H. U. Anderson and D. M. Sparlin Oct. 1984 18 p
(DE85-004296; DOE/ER-10598/5) Avail: NTIS HC A02/MF A01

The interrelationships between electrical conductivity, oxidation-reduction kinetics, defect structure, and composition of n- and p-type binary and ternary transition metal oxides were investigated. The experimental part of the investigation included specimen preparation, thermogravimetric measurements, X-ray diffraction, transmission electron microscopy, electrical conductivity, electron paramagnetic resonance, and Seebeck measurements. The oxide systems studied were La-doped SrTiO3, La-doped BaTiO3, Mg-doped LaCrO3, Mg-doped LaMnO3, Sr-doped LaMnO3, Mg- and Li-doped Cr2O3, and Nb- and Ta-doped TiO2. The electrical conductivity, carrier mobility, and defect concentration for several of the systems are discussed in detail. The most important results were obtained for the SrTiO3, LaCrO3, Cr2O3, BaTiO3, TiO2, and LaMnO3 systems for which the oxygen activity and temperature stability ranges of the electrical conductivity are defined. A particularly significant result is that the stability range of LaMnO3 is influenced by the particular element with which it is doped. DOE

N85-21308# Prins Maurits Lab. TNO, Rijswijk (Netherlands).
ISOLATION, CONCENTRATION AND SUBSEQUENT ANALYSIS BY CAPILLARY GAS CHROMATOGRAPHY OF TRACE AMOUNTS OF ORGANOPHOSPHORUS COMPOUNDS FROM AQUEOUS SAMPLES
A. Verweij and M. A. vanLiempt May 1984 29 p refs
(AD-B089301L; PML-1984-37; TDCK-79658) Avail: NTIS HC A03/MF A01

A procedure for detecting chemical warfare agents in surface water is described. Trace amounts (ppb or less) of phosphorus-containing compounds in aqueous samples were adsorbed on XAD-4 and eluted by ethyl acetate. The solvent and the eluted compounds were evaporated and swept over a Tenax-GC tube. This gas stripping method traps the phosphorous-containing compounds together with only a small amount of the solvent, whereas the water entrapped in the XAD step can be removed simultaneously. The compounds were desorbed from the Tenax-GC tube and injected into the gas chromatograph using the combination of thermal desorption, cold trapping and flash heating. Analysis was carried out on a capillary column and the compounds were detected by a flame photometric detector. The steps of the analytical procedure are discussed, including the recoveries of the different compounds and instrumental aspects. Author (ESA)

N85-21309# Cincinnati Univ., Ohio. Computing Center.
A GC/MS (GAS CHROMATOGRAPH/MASS SPECTROMETER) DATA MANAGEMENT PROCESS. PART 1: USER'S GUIDE, VERSION 1.0
Dennis P. Ryan and John P. Donnelly Oct. 1984 46 p 2 Vol.
(PB85-116051; EPA-600/4-84-083-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 05B

The gas chromatograph/mass spectrometer (GC/MS) data management process (DMP) is an example process for reducing measurement and identification data produced by a GC/MS to that necessary for input to the EPA sample file control system. This example is structured for a Finnigan Incos Data System. The user's guide explains the commands available to the user and the resulting outputs. It explains the links between the modules. Examples are also provided for assistance. GRA

N85-21310# Cincinnati Univ., Ohio. Computing Center.
A GC/MS (GAS CHROMATOGRAPH/MASS SPECTROMETER) DATA MANAGEMENT PROCESS. PART 2: PROGRAM DOCUMENTATION, VERSION 1.0
Dennis P. Ryan and John P. Donnelly Oct. 1984 175 p 2 Vol.
(PB85-116069; EPA-600/4-84-084-Pt-2) Avail: NTIS HC A08/MF A01 CSCL 05B

The Gas Chromatography/Mass Spectoscopy (GC/MS) Data Management Process (DMP) is an example process for reducing the measurement and identification data produced by a GC/MS to that necessary for input to the EPA sample file control system. This example is structured for a Finnigan Incos Data System. The DMP consists of sixteen programs written in FORTRAN IV for Data General minicomputers. Each module is described in a section of the Program Documentation along with flow charts, output sample formats, and variable description lists. The FORTRAN source code is attached. GRA

N85-21311# National Bureau of Standards, Gaithersburg, Md. Center for Chemical Engineering.
UPDATE OF THERMAL CONDUCTIVITY AND ELECTRICAL RESISTIVITY OF ELECTROLYTIC IRON, TUNGSTEN AND STAINLESS STEEL Final Report
J. G. Hust and A. B. Lankford Sep. 1984 75 p refs
(PB85-115814; NBS/SP-260/90; LC-84-601107) Avail: NTIS HC A04/MF A01; SOD HC as SN003-003-02609-3 CSCL 07D

The thermal conductivity and electrical resistivity of electrolytic iron, tungsten, and stainless steel is presented. The measurement effort that occurred since the establishment of these SRM's is described. New data are presented and, based on these, changes in the recommended values are described. The new recommended values are presented in the form of equations, graphs, and tables. GRA

N85-21312# Yale Univ., New Haven, Conn. Section of Applied Physics.
IN SITU MONITORING OF ELECTROCHEMICAL REACTIONS BY SURFACE ENHANCED RAMAN SCATTERING Annual Report, 1 Jul. 1983 - 30 Jun. 1984
Richard K. Chang and Victor E. Henrich Jul. 1984 21 p refs
(Contract GRI-5083-260-0795)
(PB85-149789; GRI-84/0172) Avail: NTIS HC A02/MF A01 CSCL 07D

Surface enhanced Raman scattering (SERS) was applied in studying interfacial H2O, D2O, OH(-)OD(-) and the protonation of PO4 and PO3(-) and Ag2O. The effects of anions, of cations, and of complexing molecules were investigated. The lineshapes of the SERS spectra for interfacial water and heavy water revealed sensitivity to the anions and cations and were explained in adsorption configuration of specific water molecules on the Ag electrode surface. An optical multichannel detection system by which the spectral range from + or - 250/cm through 0/cm can be simultaneously detected was designed. The low frequency peak and continuum which were reported to pertain to Brillouin scattering

from individual microstructures and adatom induced inelastic scattering were investigated. A technique to fabricate individual metallic spheres and spheroids on an insulating substrate and with specific edge-to-edge separation was examined. GRA

N85-21313# General Electric Co., Schenectady, N. Y.
KINETICS OF NITRIC OXIDE FORMATION IN LAMINAR AND TURBULENT METHANE COMBUSTION Annual Report, Sep. 1983 - Sep. 1984
M. C. Drake Sep. 1984 86 p refs
(PB85-149698; R-84-SRD-050; GRI-84/0204) Avail: NTIS HC A05/MF A01 CSCL 07D

Laser diagnostic (pulsed Raman, laser velocimetry, and saturated fluorescence) and probe sampling measurements on laminar opposed-flow diffusion flames and turbulent jet diffusion flames are summarized. In laminar opposed flow diffusion flames of CO H2/N2 fuel in air, measured flame temperatures are 200 K lower than equilibrium, indicating substantial superequilibrium effects similar to those in turbulent CO H2/N2 jet diffusion flames. Measurements in laminar opposed flow cH4 flames show even more pronounced temperature decrements from equilibrium (especially at high strain rates). Measurements in turbulent CO H2/N2 jet diffusion flames downstream of the flamefront demonstrate that NO formed in the flamefront is slowly converted to NO2 in the post flame region. The measured NO2/NO ratio is proportional to (CR)(sup 2) which is consistent with NO + HO2 yields NO2 + OH, as the predominate NO2 forming reaction. GRA

N85-21314# Eltron Research, Inc., Aurora, Ill.
SOLAR-ASSISTED HYDROGEN GENERATION BY PHOTOELECTROCATALYSIS Annual Report, 1 Oct. 1983 - 30 Sep. 1984
Anthony F. Sammells, Bruce W. Wessels (Northwestern Univ., Evanston), Paul M. Raccah, Ronald L. Cook, Peter G. P. Ang, Cathy E. Goodman (Northwestern Univ., Evanston), Patrick F. Dempsey, and Sharon K. Schmidt Dec. 1984 144 p refs
(PB85-149706; GRI-84/0222) Avail: NTIS HC A07/MF A01 CSCL 07E

Photoelectrode surface modification as an approach to improve the efficiency of hydrogen generation is discussed. For surface modified p-InP the dependency of exchange current density as measured before and after the inception of hydrogen evolution was examined as a function of incident light intensity. This was preformed using the surface modifications Co/Pt, Ru/Pt, Rh/Pt, Rh/Tt, Pt, Rh and Co. Experimental results indicated that a progressively lower applied cathodic bias is required for hydrogen evolution in the order Ru/Pt <Rh/Pt <Co/Pt <Rh < Pt <Co <Ru < unmodified. Photoelectrode kinetics on alpha-Fe2O3 based photoanodes can be enhanced by the incorporation of platinum within the thermally grown oxide. The overall solar efficiency, as power savings for photoelectrochemical cells using a p-InP photocathode surface modified by sequential deposited Co and Pt and a platinum counter electrode, were increased to 16% in alkaline electrolytes by depolarization of the counter electrode with monosaccharides. GRA

N85-22220*# Auburn Univ., Ala. Dept. of Physics.
CHARACTERIZATION OF MATERIAL SURFACES EXPOSED TO ATOMIC OXYGEN ON SPACE SHUTTLE MISSIONS
Albert T. Fromhold *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 12p ref (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

N85-22227*# Oregon Univ., Eugene. Dept. of Chemistry.
ANALYSES VIA AUTOMATED MASS SPECTROMETRY (MS/DS)
T. Koenig *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 22p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

N85-22237*# Alabama A & M Univ., Normal. Dept. of Chemistry.
A COMPUTER CONTROLLED MASS SPECTROMETER SYSTEM FOR INVESTIGATING THE DECOMPOSITION OF NON-METALLIC MATERIALS UNDER ATMOSPHERIC CONDITIONS
James M. Thompson *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-21315# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
TRANSVERSE MICROSTRUCTURE OF AN OXIDE SCALE FORMED ON A 20 % Cr/25 % NI NIOBIUM STABILIZED STAINLESS STEEL
M. J. Bennett, J. A. Desport, and P. A. Labun (Oxford Univ.) Sep. 1984 25 p refs
(AERE-R-11034) Avail: Issuing Activity

A transverse section through a scale forced during the oxidation of 20%Cr/25%Ni/niobium stabilized stainless steel, in carbon dioxide, for 4900h at 825 C, was examined by TEM and STEM. The detailed microstructure and microchemistry of the three discrete silica, rhombohadral and spinal oxide layers comprising the scale was revealed. It is found that variation of strain, degree of oxide order and crystallinity are consistent with the growth of the rhombohedral and spinel oxide by outward cation movement. This is controlled by diffusion through the thin, amorphous silica layer after it has grown laterally between the rhombohedral oxide layer and the steel. E.A.K.

N85-21316# United Kingdom Atomic Energy Authority, Harwell (England). Computer Science and Systems Div.
THE APPLICATION OF EXPERT SYSTEMS TO CORROSION PROBLEMS
C. Westcott, D. E. Williams, N. J. M. Wilkins, G. P. Marsh, J. N. Wanklyn, and I. F. Croall Nov. 1984 12 p refs
(AERE-M-3445) Avail: Issuing Activity

An expert system is explained and a case is made for developing and applying expert systems to corrosion problems. The nature and structure of expert-customer interactions and the implementation of similar dialogs between computer and user are considered. Problems associated with the user-interface to an expert system are addressed and examples of prototype systems are given. A.R.H.

N85-21317# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
THE ROLE OF DISLOCATIONS IN ULTRASONIC ATTENUATION
S. Perring, R. L. Smith, B. Hudson, and W. N. Reynolds Oct. 1984 19 p refs
(AERE-R-11384) Avail: Issuing Activity

Ultrasonic attenuation measurements were made on high purity polycrystalline aluminum in various states of deformation and recovery. The results indicate that the dislocation content of polycrystalline aluminum is a major and separable contribution to the total ultrasonic attenuation. This substantiates observations on the role of dislocations in the ultrasonic attenuation of steels. Author

N85-21318 Department of the Air Force, Washington, D.C.
METHOD FOR REFINING MICROSTRUCTURES OF CAST TITANIUM ARTICLES Patent
D. Eylon and F. H. Froes, inventors (to Air Force) Issued 13 Nov. 1984 7 p Supersedes AD-D010982
(AD-D011518; US-Patent-4,482,398; US-Patent-Appl-SN-574433;

US-Patent-Class-148-11.5) Avail: US Patent and Trademark Office CSCL 11/6

The microstructure of titanium alloy castings is improved by a process which comprises beta-solution heat which treats the cast article at or near the beta-transus temperature of the alloy. The article is cooled to room temperature at a rate in excess of air cooling and aging the article at a temperature about 0.8 to 0.9 of the beta-transus. Author (GRA)

N85-21319 Department of the Navy, Washington, D. C.
LOW TEMPERATURE DEPOSITION OF NICKEL FILMS Patent
A. D. Berry, inventor (to Navy) Issued 23 Oct. 1984 4 p Supersedes AD-D010586
(AD-D011568; US-Patent-4,478,890; US-Patent-Appl-SN-531387; US-Patent-Class-427-252) Avail: US Patent and Trademark Office CSCL 13/8

This invention relates to a low-temperature, electroless process for the plating of nickel metal upon a substrate. Nickel, olefin, and trifluorophosphine vapors are condensed and reacted in a vessel. The reaction product is distilled off and condensed onto the surface of a substrate. The surface is warmed and the reaction product allowed to decompose, yielding a coating of nickel metal upon the substrate, gaseous olefin and Ni(PF3)4. GRA

N85-21320*# Case Western Reserve Univ., Cleveland, Ohio.
EFFECT OF REDUCTION OF STRATEGIC COLUMBIUM ADDITION IN 718 ALLOY ON THE STRUCTURE AND PROPERTIES Final Report
Karl R. Ziegler and John F. Wallace Jan. 1985 179 p refs (Grant NAG3-268)
(NASA-CR-174841; NAS 1.26:174841) Avail: NTIS HC A09/MF A01 CSCL 11F

A series of alloys was developed having a base composition similar to Inconel 718, with reduced Cb levels of 3.00 and 1.10 wt% Cb. Substitutions of 3.0% W, 3.0W + 0.9V or Mo increased from 3.0% to 5.8% were made for the Cb in these alloys. Two additional alloys, one containing 3.49% Cb and 1.10% Ti and another containing 3.89% Cb and 1.29% Ti were also studied. Tensile properties at rooom and elevated temperatures, stress-rupture tests, and an analysis of extracted phases were carried out for each of the alloys. Additions of solid solution elements to a reduced Cb alloy had no significant effect on the properties of the alloys under either process condition. The solution and age alloys with substitutions of 1.27% i at 3.89% Cb had tensile properties similar top hose of the original alloy and stress-rupture properties superior to the original alloy. The improved stress-rupture properties were the result of significant precipitation of Ni3Ti-gamma prime in the alloy, which is more stable than gamma' at the elevated temperatures. At lower temperatures, the new alloy benefits from gamma' strengthening. With more precise control and proper processing, the reduced Cb direct-age alloy could substitute for Alloy 718 in high strength applications. A.R.H.

N85-21321*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL TEMPERATURE AND VELOCITY CONTROL OF MACH 0.3 ATMOSPHERIC PRESSURE DURABILITY TESTING BURNER RIGS IN LONG TIME, UNATTENDED CYCLIC TESTING
Daniel L. Deadmore Mar. 1985 37 p refs
(NASA-TM-86959; E-2484; NAS 1.15:86959) Avail: NTIS HC A03/MF A01 CSCL 11F

Hardware and software were developed to implement the hybrid digital control of two Jet A-1 fueled Mach 0.3 burners from startup to completion of a preset number of hot corrosion flame durability cycle tests of materials at 1652 F. This was accomplished by use of a basic language programmable microcomputer and data aquisition and control unit connected together by the IEEE-488 Bus. The absolute specimen temperature was controlled to + or - 3 F by use of digital adjustment of the fuel flow using a P-I-D (Proportional-Integral-Derivative) control algorithm. The specimen temperature was within + or - 2 F of the set point more than 90 percent of the time. Pressure control was achieved by digital adjustment of the combustion air flow using a proportional control algorithm. The burner pressure was controlled at 1.0 + or - 0.02 psig. Logic schemes were incorporated into the system to protect the test specimen from abnormal test conditions in the event of a hardware of software malfunction. Author

N85-21322*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALLOYS BASED ON NiAl FOR HIGH TEMPERATURE APPLICATIONS
K. Vedula (Case Western Reserve Univ.), V. Pathare, I. Aslanidis (Case Western Reserve Univ.), and R. H. Titran 1984 13 p refs Presented at the 1984 Fall Meeting of Materials Research Society, Boston, 26-30 Nov. 1984
(NASA-TM-86976; E-2513; NAS 1.15:86976) Avail: NTIS HC A02/MF A01 CSCL 11F

The NiAl alloys for potential high temperature applications were studied. Alloys were prepared by powder metallurgy techniques. Flow stress values at slow strain rates and high temperatures were measured. Some ternary alloying additions (Hf, Ta and Nb) were identified. The mechanism of strengthening in alloys containing these additions appears to be a form of particle dislocation interaction. The effects of grain size and stoichiometry in binary alloys are also presented. E.A.K.

N85-21323*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF CHROMIUM AND ALUMINUM ON MECHANICAL AND OXIDATION PROPERTIES OF IRON-NICKEL-BASE SUPERALLOYS BASED ON CG-27
Susan R. Schuon Mar. 1985 26 p refs Presented at the TMS-AIME Fall Meeting, Detroit, 17-20 Sep. 1984
(NASA-TP-2443; E-2320; NAS 1.60:2443) Avail: NTIS HC A03/MF A01 CSCL 11F

The effects of chromium and aluminum on the mechanical and oxidation properties of a series of gamma-prime-strengthened alloys based on CG-27 were studied. Gamma-prime dispersion and solid-solution strengthening were the principal modes of alloy strengthening. The oxidation attack parameter K sub a decreased with increasing Cr and Al contents for each alloy group based on Al content. As a group, alloys with 3 wt % Al had the lowest attack parameters. Therefore, 3 wt % is the optimum level of Al for parabolic oxidation behavior. Spalling, due to diffusion-induced grain growth, was controlled by the overall Cr and Al levels. The alloy with 4 wt % Cr and 3 wt % Al had stress-rupture properties superior to those of the base alloy, CG-27, and maintained parabolic oxidation behavior while the Cr content was reduced by two-thirds of its value in cast CG-27. E.A.K.

N85-21324*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION-BEAM NITRIDING OF STEELS Patent Application
Joshua Salik and Theodore E. Hubbell, Jr., inventors (to NASA) Filed 16 Oct. 1984 12 p
(NASA-Case-LEW-14104-1; NAS 1.71:LEW-14104-1; US-Patent-Appl-SN-661481) Avail: NTIS HC A02/MF A01 CSCL 11F

A surface of a steel substrate is nitrided by exposing it to a beam of nitrogen ions under a low pressure. The pressure is much lower than that employed for ion-nitriding, and an ion source is used instead of a glow discharge. Both of these feathers reduce the introduction of impurities into the substrate surface. NASA

N85-21325*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A PROCESS TO PRODUCE FINE LINE METALLIC COLLECTION PATTERNS ON SEMICONDUCTORS DEVICES Patent Application
Brian D. Gallagher, inventor (to NASA) Filed 20 Dec. 1984 13 p (Contract NAS7-918)
(NASA-Case-NPO-16413-1; NAS 1.71:NPO-16413-1; US-Patent-Appl-SN-648185) Avail: NTIS HC A02/MF A01 CSCL 11F

A method is described for forming thin conductive metal lines

on a nonmetallic substrate. A metallizable compound is applied to the substrate in a substantially uniform thin film. Heating radiation is applied to the film along a plurality of separated fine lines, but not to the area between the lines, to heat the film along said lines to a temperature at which the metallizable compound is converted to a metal and gases that drift away. A solvent is then applied to the film to wash away the areas that have not been metallized. NASA

N85-21326# Aeronautical Research Labs., Melbourne (Australia).
HYDROGEN EMBRITTLEMENT OF CADMIUM-PLATED ULTRA-HIGH STRENGTH STEELS IN PAINT STRIPPERS
W. J. Pollock Aug. 1984 15 p refs
(ARL-MAT-R-117; AR-003-955) Avail: NTIS HC A02/MF A01

Slow strain rate and electrochemical tests were applied to elucidate the mechanism of hydrogen embrittlement of high strength 4340 steel by paint strippers. Results show that hydrogen embrittlement does not occur unless the steel is cadmium plated and is due to hydrogen generation produced by the establishment of a galvanic couple between the steel and the cadmium in the paint stripper. The amount of embrittlement is seen to increase as the galvanic potential becomes increasingly more negative compared with the potential for the reduction of water to produce hydrogen. The role of inhibitors in the prevention of hydrogen embrittlement is discussed. Author

N85-21327# Northeastern Univ., Boston, Mass. Inst. of Chemical Analysis and Materials Science.
ALLOY DEVELOPMENT, PROCESSING AND CHARACTERIZATION OF DEVITRIFIED TITANIUM BASE MICROCRYSTALLINE ALLOYS Annual Report, Sep. 1983 - Aug. 1984
S. H. Whang Dec. 1984 113 p
(Contract N00014-82-K-0597)
(AD-A149609) Avail: NTIS HC A06/MF A01 CSCL 11/6

Principles that govern metastability in rapidly solidified Ti alloys have been investigated with respect to solid solubility and phase transformation. Subsequent heat treatment in ternary Ti alloys results in precipitation reaction between group IIIA or IVA elements and rare earth metals in the absence of Ti. The Ostwald ripening of these binary dispersoids (rare earth metals Y, La, Er - Al or Sn compounds) has been and is being studied. Characteristics such as transient coarsening behavior and very slow coarsening in these dispersoids were identified. Mechanical properties (hardness) of alloy ribbon and splat were studied through isochronal and isothermal heat treatment. The alloy ingot was consolidated from alloy flakes by HIPing and is being studied with respect to mechanical properties. GRA

N85-21328# Ohio State Univ., Columbus.
STRESS CORROSION CRACKING AND OXIDATION CHARACTERISTICS OF BORIDE-STRENGTHENED MICROCRYSTALLINE IRON AND NICKEL BASED ALLOYS Annual Report, 1 Jul. 1983 - 30 Jun. 1984
C. Mobley, R. Hoagland, S. Smialowska, R. Rapp, and M. Straszheim 22 Oct. 1984 110 p
(Contract N00014-82-K-0485)
(AD-A149805; OSURF-TR-2) Avail: NTIS HC A06/MF A01 CSCL 11/6

This report summarizes the microstructures, room and elevated temperature mechanical properties, fracture toughness, oxidation, general corrosion and stress corrosion cracking characteristics of two iron-based and two nickel-based microcrystalline alloys. These microcrystalline alloys appear suitable for a number of intermediate temperature (i.e., 500 to 800 C) applications. GRA

N85-21329# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
STRESS CORROSION CRACKING BEHAVIOR OF TUNGSTEN HEAVY ALLOYS Final Report
J. G. Chung and D. J. Duquette Watervliet, N.Y. Army Armament Research and Development Command Oct. 1984 152 p
(Contract DAAA22-81-C-0138)
(AD-A149843; AD-E440264; ARLCB-CR-84034) Avail: NTIS HC A08/MF A01 CSCL 11/6

Stress corrosion cracking behavior of 90W-Ni-Fe (W-10) and 97W-Ni-Fe-Cu-Co (W-3) alloys has been studied in solutions of NaCl, NACE, and 10% H2SO4. The influences of electrochemical polarization, hydrogen catalyst, and heat treatment on KISCC, static load crack growth rate, and fracture morphology were studied. GRA

N85-21330# Naval Research Lab., Washington, D. C.
EFFECTS OF B, Ti AND Ta IMPLANTATION ON THE WEAR RESISTANCE OF Fe AND Ni-PLATED Fe Final Report, Oct. 1983 - Sep. 1984
I. L. Singer and K. J. Hafterson 30 Jan. 1985 16 p
(AD-A149947; NRL-MR-5512) Avail: NTIS HC A02/MF A01 CSCL 11/6

The wear behavior of Fe and Ni-plated Fe implanted with B, Ti or Ta ions (single or dual implants) has been evaluated. Friction coefficients were measured during repeated unidirectional, low speed (0.1 mm/sec) dry sliding of a hardened steel ball at high contract stress (0.85 GPa). In fe, the dual implants of B + Ti reduced the coefficient of friction from 0.6 (the nonimplanted value) to 0.3 and prevented the adhesive wear damage observed on nonimplanted surfaces. Although less effective than B + Ti, B + Ta and B reduced the coefficient of friction (initially) and resisted wear better than the nonimplanted surface. In Ni-plated Fe, B implantation delayed adhesive wear and reduced the coefficient of friction from 0.5 (the nonimplanted value) to 0.4. Implantation of Ti and Ti + B produced a higher coefficient of friction (0.6) and increased adhesive wear. Originator furnished key words include: Ion implantation, Ni-plate, Friction, Wear resistance. GRA

N85-21331# Nebraska Univ., Lincoln. Dept. of Chemistry.
PREPARATION AND STUDY OF HIGHLY REACTIVE METAL POWDERS Final Report, 1 Oct. 1977 - 15 Mar. 1984
R. D. Rieke 1984 22 p
(Contract DAAG29-81-K-0041; Grant DAAG29-78-G-0007)
(AD-A150026; ARO-15255.4-CH; ARO-17899.6-CH) Avail: NTIS HC A02/MF A01 CSCL 07/2

We recently discovered that highly reactive metal powders can be prepared by the reduction of metal salts from ethereal or hydrocarbon solvents. Common reducing agents are potassium, sodium, lithium, or other reducing agents of high enough potential. The reduction yields the metal in a finely divided state. Metals studied to date exhibit far supersonic reactivity towards organic and inorganic substrates to that described in the literature for these metals. We recently have shown that this approach will work with transition metals including nickel, palladium, platinum, cobalt, iron, and uranium. We proposed to study the chemistry of these highly reactive metals. We wished to examine these metals in a variety of oxidative-insertion reactions, preparation of zero-valent derivatives, and catalytic reactions. Several new organo-metallic complexes with potential catalytic activity were proposed. Originator supplied key words include: Metal powders; Cobalt; copper; Magnesium; Palladium; Chemical reactivity; Organometallic complexes. GRA

N85-21332# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
SOME UNIQUE ASPECTS OF FOULING ON COPPER AS COMPARED TO TITANIUM OR NICKEL Interim Report
M. E. Schrader and J. A. Cardamone Jan. 1985 18 p
(AD-A150072; DTNSRDC/SME-84-51) Avail: NTIS HC A02/MF A01 CSCL 11/6

Auger Electron Spectroscopy (AES) and X-ray Photoelectron Spectroscopy (XPS) are utilized to aid in gathering information on the nature of the molecular layer that is adsorbed to artificial surfaces immersed in seawater, and its role in subsequent bacterial adhesion. We have found by means of AES that the composition of molecular films absorbed on titanium is consistent with that of carbohydrates. On copper the adsorption results in high concentrations of nitrogen, suggesting a chemical reaction of the copper surface with the adsorbed nitrogen-containing organic material. The XPS studies revealed chemical shifts of the characteristic is

electron binding energy of nitrogen on copper as compared to nitrogen on titanium, thereby providing further evidence of the chemical reaction and indicating that the nitrogen is in reduced form. Quantitative analysis by means of XPS yields an elemental analysis of the molecular layer that is consistent with an organometallic copper complex with coordination number of four. GRA

N85-21333# Argonne National Lab., Ill. Materials Science and Technology Div.
SPUTTER-INDUCED COMPOSITIONAL MODIFICATIONS IN A Ni-Au ALLOY
N. Q. Lam, H. A. Hoff, and P. G. Regniert (Centre d'Etudes Nucl., Gif-sur-Yvette, France) Sep. 1984 14 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3-6 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-002771; CONF-841246-2) Avail: NTIS HC A02/MF A01

Surface and subsurface compositional changes induced by heating and by ion sputtering of a Ni-6 at. % Au alloy at temperatures between 25 and 600 deg C were measured in situ, by ion scattering spectroscopy. Upon heating, Au atoms segregated to the alloy surface; the enthalpy and entropy of Gibbsian adsorption were found to be -0.45 eV and -1.09K. During sputtering, the steady state surface composition was noticeably temperature dependent above approx. 400 deg C, which could be interpreted in terms of significant contributions of the second atom layer to the sputtered atom flux. Steady state concentration profiles masured after rapid cooling of the target to room temperature were analyzed to gain information about the temperature dependence of the effective altered layer thickness, from which the radiation enhanced diffusion coefficients in the bombarded alloy were determined. DOE

N85-21334# State Univ. of New York, Stony Brook.
CHEMISORPTION THEORY: ADSORPTION ON COPPER-NICKEL ALLOYS AND TITANIUM SURFACE EMBRITTLEMENT Final Research Report, 15 Jun. 1983 - 14 Jun. 1984
J. L. Whitten 1984 8 p refs
(Contract DE-AC02-83ER-45021)
(DE85-001815; DOE/ER-45021/2) Avail: NTIS HC A02/MF A01

The research is part of a theoretical program on the structure of molecules adsorbed on solid surfaces and dissociative chemisorption with emphasis on transition metal substrates. An embedding theory for treating chemisorption on metals will be applied to several systems involving titanium, copper, nickel and copper-nickel alloy substrates, and H2, H, Co, C and coadsorbed H and C adsorbates. DOE

N85-21335# Brookhaven National Lab., Upton, N. Y.
MAGNETIC X-RAY SCATTERING STUDIES OF THE RARE EARTH METAL HOLMIUM
D. Gibbs, D. E. Moncton, and K. L. DAmico 1984 18 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contract DE-AC02-76CH-00016)
(DE85-003608; BNL-35424; CONF-841184-18) Avail: NTIS HC A02/MF A01

The results of recent magnetic X-ray scattering experiments on the rare earth metal Ho performed using both a rotating anode source and synchrotron radiation are presented. Specifically, the Ho(001) (+) magnetic satellite was measured in the simple spiral antiferromagnetic phase between 132K and 20K and in the conical phase below 20K. Although the cross section for magnetic X-ray scattering is reduced from the usual Thomson cross-section by a factor of approx. = 10(5), the incommensurate magnetic satellites are well separated from the main Bragg peaks. Thus, detection of the satellites is possible with a rotation anode source and extensive high resolution studies of them are straightforward with synchrotron radiation. The assembled data are in good agreement with the results of magnetic neutron scattering published previously for different Ho samples. DOE

N85-21336# Monsanto Research Corp., Miamisburg, Ohio.
PROTON NMR AND SUSCEPTIBILITY MEASUREMENTS IN TiCoH/SUB x
R. C. Bowman, Jr., B. D. Craft, W. E. Tadlock, E. L. Venturini (SNL), and J. S. Cantrell (Miami Univ., Oxford, Ohio) 1984 15 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contracts DE-AC04-76DP-00053; DE-AC04-76DP-00789)
(DE85-003309; MLM-3192(OP); CONF-841184-15) Avail: NTIS HC A02/MF A01

The proton spin-lattice relaxation times (T1) and magnetic susceptibilities (chi) are used to study the effects of hydrogen on the electronic structure properties of the intermetallic compound TiCo. Hydrogen addition systematically decreases both chi (T) and the proton (T sub 1 T) sup 1/2 parameters, which are directly proportional to the local density of the Fermi level electronic states. The behavior for TiCoH (sub x) is completely opposite to that previously found for several other Ti-based metal hydrides where these parameters tend to increase with hydrogen content. These differences are attributed to the Fermi levels falling on alternate sides of peaks in the densities of electronic states. The present results for TiCoH (sub x) are compared with the magnetic properties and the theoretical band structures for the closely related hydride TiFeH (sub x). DOE

N85-21337# Knolls Atomic Power Lab., Schenectady, N. Y.
CONTINUOUS MEASUREMENT OF ZIRCALOY CORROSION IN AIR WITH AN ULTRASONIC CORROSION MONITOR
R. J. Grossman Nov. 1984 23 p refs Presented at the IEEE Ultrasonics Symp., Dallas, 14 Nov. 1984
(Contract DE-AC12-76SN-00052)
(DE85-003663; KAPL-4181; CONF-8411119-4) Avail: NTIS HC A02/MF A01

The Ultrasonic Corrosion Monitor (UCM) produces a continuous, in-situ, real-time characterization of corrosion film formation. The monitor, which measures its own corrosion, has a film thickness measurement resolution of better than 0.1 (MU)m (0.004 mil). The technique is particularly well suited to severe or inaccessible environments, such as those experienced by nuclear materials, where standard corrosion measurement techniques require costly and time-consuming shutdown/measurement/startup cycles of the test facility. The physical basis or the UCM is described. The results of a corrosion experiment with a zircaloy ultrasonic monitor, which was exposed to 680 (0) F air for over 7200 h is discussed. The results of the zircaloy corrosion experiment demonstrate that the corrosion film thickness determined by the ultrasonic monitor corresponds directly to that determined by standard weight gain measurements. The UCM is expected to aid considerably in understanding and characterizing zircaloy corrosion. More generally, the concept is applicable to a broad range of materials and environments. DOE

N85-21338# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROCHEMICAL CELL TO MEASURE CORROSION RATES IN NONCONDENSING ENVIRONMENTS
J. J. Truhan, C. Chen, and F. C. Kirk Oct. 1984 22 p refs Presented at the 12th DOE Compatibility Meeting, Kansas City, Kans.
(Contract W-7405-eng-48)
(DE85-003148; UCRL-91581; CONF-8410198-1) Avail: NTIS HC A02/MF A01

An electrochemical cell was used to estimate corrosion rates in water-saturated air (100% relative humidity). Corrosion rates for a variety of metal and alloys in water-saturated air in the electrochemical cell with the corrosion rates of these materials in aerated and deaerated deionized water in an aqueous cell are discussed. For most materials, corrosion rates in the humid-air environment were not more than an order of magnitude lower than those in water. Faraday's-law calculations were used to determine corrosion rates by linear polarization and by Tafel extrapolation. Galvanic potentials and currents between selected dissimilar-metal couples are also measured. DOE

N85-21339# Hanford Engineering Development Lab., Richland, Wash.
EFFECTS OF NEUTRON IRRADIATION ON THE FRACTURE PROPERTIES OF HT-9 WELD
F. H. Huang and D. S. Gelles 8 Oct. 1984 23 p refs Presented at the Ann. Meeting of the Soc. of Mining Engr., New York, 24 Feb. 1985
(Contract DE-AC06-76FF-02170)
(DE85-001068; HEDL-SA-3196-FP; CONF-850211-1) Avail: NTIS HC A02/MF A01

Fracture toughness tests were performed at 93, 205, 316 and 427 C using electropotential techniques on HT-9 weld material irradiated to a fluence of 2.35 x 10 to the 22nd power n/sq cm (E > 0.1 MeV) at 390 C. Testing of welds irradiated at 450, 500 and 550 C was performed at 205 C. Test results were analyzed using the J-integral approach. It was found that the fracture toughness of these HT-9 welds increased slightly, while the tearing modulus decreased significantly after irradiation to a fluence of 2.35 x 10 to the 22nd power n/sq cm. In addition, results showed that irradiation temperature had little effect on the fracture toughness of HT-9 weld metal. The specimens were examined by scanning electron microscopy after the test in order to understand the fracture process in this weld material. DOE

N85-21340# Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
SYNTHESIS, STATIC AND REACTIVE CHARACTERIZATION OF SUPPORTED ORGANOMETALLICS Progress Report
A. Brenner 23 Nov. 1984 12 p refs
(Contract DE-AC02-79ER-10381)
(DE85-004285; DOE/ER-10381/6) Avail: NTIS HC A02/MF A01

The primary impetus was the development and evaluation of new catalysts prepared by the thermal and photolytic activation of organometallic complexes directly deposited on high surface area refractory supports. Emphasis was placed on the use of carbonly complexes decomposed on alumina and in comparing the activity of these materials to traditional catalysts prepared by the reduction of salts. Specific goals were to: (1) extend previous studies of temperature programmed decomposition (TPDE) and characterization of the resulting catalysts; (2) extend the model reactions to include benzene hydrogenation and possibly other reactions; (3) study photolytic activation as an alternative to thermal decarbonylation of supported complexes; and (4) develop the concept of reactive characterization. DOE

N85-21341# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France). Lab. Techniques Nouvelles.
COMPARISON OF THE FATIGUE RESISTANCE (INITIATION, PROPAGATION) OF CAST TA6V WITH HOT ROLLED TA6V [COMPARAISON DE LA RESISTANCE A LA FATIGUE (INITIATION-PROPAGATION) DU TA6V DE FONDERIE AVEC LE TA6V CORROYE, ESSAIS 17.216, COMPTE RENDU D'ESSAI, PREMIERE PARTIE]
Maria 25 Jun. 1984 69 p In FRENCH Sponsored by Service Technique des Programmes Aeronautiques
(DGT-25369-Pt-1) Avail: NTIS HC A04/MF A01

Tensile characterization, fatigue initiation tests and fracture examination were carried out in order to compare the fatigue resistance of the alpha-beta hot rolled structure with the needle like alpha structure of cast TA6V material. Tests made on specimens with a hole show a better performance of the hot rolled material, with a gain of 36% in tensile load. The fretting resistance is also greater, but the results are related to the type of surface protection (cadmium or phosphating) and to assembling interference. Author (ESA)

N85-21342# Thyssen Stahl A.G., Duisburg (West Germany).
HIGH STRENGTH STEEL SHEET WITH DUAL PHASE STRUCTURE Final Report, Nov. 1983
Olaf Maid and Wolfgang Mueschenborn Bonn Bundesministerium fuer Forschung und Technologie Oct. 1984 91 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-219; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

Dual phase steel was produced on existing annealing lines. The developmental work was focussed on the production of hot dip galvanized cold strip, since the use of high strength steel sheets with reduced sheet thickness requires a better corrosion protection. The influence of the chemical composition on mechanical properties and zinc adhesion was investigated in laboratory tests. Mill trials on a hot dip galvanizing line reveal that it is feasible to produce hot dip galvanized dual phase cold strip. The results show that a structure of ferrite/bainite/martensite has mechanical properties comparable to dual phase steels.
Author (ESA)

N85-21343# Vereinigte Aluminium-Werke A.G., Bonn (West Germany). Leichtmetall-Forschungsinstitut.
CARBON FILTER PLATES FOR ALUMINUM FILTRATION AT CASTING Final Report, Dec. 1982
Siegfried Wilkening Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-242; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

Porous filter plates based on carbon were developed for the removal of insoluble, suspended, small particles as well as sodium and lithium from liquid aluminum before casting. The following processes for the fabrication of porous permeable filter bodies of carbon were tested: bonding of coarse coke fractions and spherical granules by pitch; foaming of carbon pastes; addition of pore-creating substances; and application of filter boxes filled with coke grains. The carbon filter plates show an insufficient penetration capacity for aluminum and require higher preheating temperatures than ceramic foam filters. Author (ESA)

N85-21344# Max-Planck-Inst. fuer Eisenforschung, Duesseldorf (West Germany).
INVESTIGATION OF THE DEVELOPMENT POSSIBILITIES OF A FERRITIC CREEP AND OXIDATION-RESISTANT STEEL FOR APPLICATION UNDER CREEP CONDITIONS ABOVE 650 DEG C Final Report, Dec. 1983
Juergen Peterseim, Manfred Schumacher, and Gerhard Sauthoff Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 112 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-244; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23.50

Model steels application possibilities at higher temperatures were investigated. Ferritic creep-resistant steels can only be applied up to 600 C because of their limited creep and oxidation resistance. The model steels contain chromium and varying amounts of niobium carbide or chi-phase. Mechanical short term behavior, oxidation resistance; and creep behavior were studied. Results indicate that the creep resistance of austenitic steels can be reached with ferritic steels the ductility of which, however, has to be increased. This gives the basis for the development of corresponding materials. Author (ESA)

N85-21345# VDEH-Institut fuer Angewandte Forschung G.m.b.H., Duesseldorf (West Germany). Betriebsforschungsinstitut.
NONDESTRUCTIVE TESTING OF STAINLESS STEEL TO IMPROVE QUALITY AND OUTPUT EFFICIENCY OF THE PROCESSING OF INGOT AND CONTINUOUS CASTING Final Report, Dec. 1982
Hans Walter Janzen (Krupp Suedwestfalen AG), Guenther Coen, Roland Keck, Fritz Isselstein, Ernst Luhn, and Dietmar Oberhof Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-240; ISSN-0340-7608) Avail: NTIS

HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

Nondestructive test methods for the detection of inner flaws in stainless steels were developed: ultrasonic examination of ingots and slab ingots using contact technique; thermal testing of strips; and ultrasonic examination of strips using electrodynamically excited plate waves. The third method proves to be particulary suitable. For its application, an inspection device was developed and used for the detection of inner defects in hot rolled strips. The control of the device is done automatically by a microcomputer. The resulting test data are suited as basic material for a quality record. Author (ESA)

N85-21346# Bureau of Mines, Albany, Oreg.
PARTIAL REPLACEMENT OF CHROMIUM IN AUSTENITIC STAINLESS STEELS BY MOLYBDENUM, COPPER, AND VANADIUM, REPORT OF INVESTIGATIONS 1984
S. C. Rhoads, S. J. Bullard, and M. L. Glenn 1984 19 p refs (PB85-116508; BM-RI-8900; LC-84-600163) Avail: NTIS HC A02/MF A01 CSCL 11F

Nine Fe-9Cr-12Ni alloys containing additions of 0 to 5 pct Mo, 0 to 2 pct V, and 0 to 2 pct Cu were selected for evaluation. All of the experimental alloys containing 5 pct Mo and an alloy containing 2Mo-2V-2Cu possessed structure and tensile strengths similar to those of type 304 SS. Alloys containing 5Mo-2V and 5Mo-2V-2Cu had acceptable welding properties as measured by the Varestraint test. Alloys containing at least 2 pct Mo had corrosion resistance comparable to that of type 304 SS in solutions of nitric acid, phosphoric acid, acetic acid, and critic acid. In chlorides, all the experimental alloys were susceptible to localized corrosion and stress corrosion cracking similar to that of type 304 SS. The corrosion properties were established by weight-loss tests, electrochemical polarization tests, and stress-corrosion cracking tests. An Fe-9Cr-12Ni-5Mo-2V alloy and an Fe-9Cr-12Ni-5Mo-2V-2Cu alloy had a combination of welding properties, tensile properties, and corrosion resistance that were most comparable to those of 304 SS. GRA

N85-22224*# Auburn Univ., Ala. Dept. of Mechanical Engineering and Materials Engineering.
THE STRENGTH AND CHARACTERISTICS OF VPPA WELDED 2219-T87 ALUMINUM ALLOY
Wartan A. Jemian *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 35p refs (For primary document see N85-22210 12-80) Avail: NTIS HC A99/MF E03 CSCL 11F

N85-22235*# Alabama Univ., Huntsville. Dept. of Mechanical Engineering.
EXPERIMENTAL DETERMINATION OF SYSTEMS SUITABLE FOR STUDY AS MONOTECTIC BINARY METALLIC ALLOY SOLIDIFICATION MODELS
James E. Smith, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-21347* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHOSPHORUS-CONTAINING IMIDE RESINS Patent
Indra K. Varma (NAS-NRC, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Issued 29 Jan. 1985 7 p Filed 9 Jun. 1983 Division of US Patent Appl. SN-288267, US Patent-4,395,557, filed 30 Jul. 1981, which is a continuation-in-part of US Patent Appl. SN-175452, US Patent-4,276,344, filed 5 Aug. 1980
(NASA-Case-ARC-11368-2; NAS 1.71:ARC-11368-2; US-Patent-4,496,701; US-Patent-4,395,557; US-Patent-4,276,344; US-Patent-Appl-SN-502820; US-Patent-Appl-SN-288267; US-Patent-Appl-SN-175452; US-Patent-Class-526-262; US-Patent-Class-526-274; US-Patent-Class-528-167; US-Patent-Class-528-168; US-Patent-Class-528-170; US-Patent-Class-528-321; US-Patent-Class-528-322) Avail: US Patent and Trademark Office CSCL 11B

Cured polymers of bis and tris-imides derived from tris(m-aminophenyl) phosphine oxides by reaction with maleic anhydride or its derivatives, and addition polymers of such imides, including a variant in which a monoimide is condensed with a dianhydride and the product is treated with a further quantity of maleic anhydride prior to curing are disclosed and claimed. Such polymers are flame resistant. Also disclosed are an improved method of producing tris(m-aminophenyl) phosphine oxides from the nitro analogues by reduction with hydrazine hydrate using palladized charcoal or Raney nickel as the catalyst and fiber reinforced cured resin composites.
Official Gazette of the U.S. Patent and Trademark Office

N85-21348* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHTHALOCYANINE POLYMERS Patent
Bappalige N. Achar (NAS-NRS, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Issued 12 Feb. 1985 14 p Filed 10 Nov. 1982 Supersedes N83-14275 (21 - 05, p 0643)
(NASA-Case-ARC-11413-1; US-Patent-4,499,260; US-Patent-Appl-SN-440656; US-Patent-Class-528-229; US-Patent-Class-528-125; US-Patent-Class-528-126; US-Patent-Class-528-128; US-Patent-Class-528-166; US-Patent-Class-528-185; US-Patent-Class-528-186; US-Patent-Class-528-187; US-Patent-Class-528-226; US-Patent-Class-528-352; US-Patent-Class-528-353) Avail: US Patent and Trademark Office CSCL 07D

A method of forming 4,4',4'',4''' -tetraamino phthalocyanines involves reducing 4,4',4'',4''' -tetranitro phthalocyanines, polymerizing the metal tetraamino phthalocyanines with a tetracarboxylic dianhydride (preferably aromatic) or copolymerizing with a tetracarboxylic dianhydride and a diamine (preferably also aromatic) to produce amic acids which are then dehydrocyclized to imides. Thermally and oxidatively stable polymers result which form tough, flexible films, varnishes, adhesives, and fibers.
Official Gazette of the U.S. Patent and Trademark Office

N85-21349* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELASTOMER TOUGHENED POLYIMIDE ADHESIVES Patent
Anne K. St.Clair and Terry L. St.Clair, inventors (to NASA) Issued 5 Feb. 1985 7 p Filed 28 Jan. 1983 Supersedes N83-29390 (21 - 18, p 2900) Division of US Patent No. 4,389,504, US Patent Appl. SN-308201, filed 2 Oct. 1981
(NASA-Case-LAR-12775-2; NAS 1.71:LAR-12775-2; US-Patent-4,497,935; US-Patent-Appl-SN-461788; US-Patent-Class-525-181; US-Patent-Class-525-182; US-Patent-Class-525-183; US-Patent-Class-525-184; US-Patent-Class-525-474; US-Patent-4,389,504; US-Patent-Appl-SN-308201) Avail: US Patent and Trademark Office CSCL 11A

A rubber-toughened, addition-type polyimide composition is disclosed which has excellent high temperature bonding characteristics in the fully cured state and improved peel strength and adhesive fracture resistance physical property characteristics. The process for making the improved adhesive involves preparing the rubber-containing amic acid prepolymer by chemically reacting an amine-terminated elastomer and an aromatic diamine with an aromatic dianhydride with which a reactive chain stopper anhydride has been mixed, and utilizing solvent or mixture of solvents for the reaction.
Official Gazette of the U.S. Patent and Trademark Office

N85-21350* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL APPROACH FOR CONTROLLING NADIMIDE CURE TEMPERATURE AND RATE WITH MALEIMIDE Patent
Richard W. Lauver, inventor (to NASA) Issued 5 Feb. 1985 9 p Filed 14 Dec. 1983 Supersedes N84-22698 (22 - 13, p 1953) Division of US Patent Appl. SN-516217, filed 22 Jul. 1983
(NASA-Case-LEW-13770-3; NAS 1.71:LEW-13770-3; US-Patent-4,497,948; US-Patent-Appl-SN-561431; US-Patent-Class-528-342; US-Patent-Class-526-217; US-Patent-Class-526-262; US-Patent-Class-528-229; US-Patent-Class-528-315; US-Patent-Class-528-322; US-Patent-Class-528-336; US-Patent-Appl-SN-516217) Avail: US Patent and Trademark Office CSCL 07D

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 C by controlling the available concentration of the maleic end-capped reactant. Control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymers, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant. Author

N85-21351* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL APPROACH FOR CONTROLLING NADIMIDE CURE TEMPERATURE AND RATE WITH MALEIMIDE Patent
Richard W. Lauver, inventor (to NASA) Issued 5 Feb. 1985 9 p Filed 14 Dec. 1983 Supersedes N84-22699 (22 - 13, p 1953) Division of US Patent Appl. SN-516217, filed 22 Jul. 1983
(NASA-Case-LEW-13770-4; NAS 1.71:LEW-13770-4; US-Patent-4,497,939; US-Patent-Appl-SN-561429; US-Patent-Class-526-262; US-Patent-Class-528-229; US-Patent-Class-528-322; US-Patent-Class-528-342; US-Patent-Appl-SN-516217) Avail: US Patent and Trademark Office CSCL 07D

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the available of the maleic-capped reactant. Author

N85-21352* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL APPROACH FOR CONTROLLING NADIMIDE CURE TEMPERATURE AND RATE Patent
Richard W. Lauver, inventor (to NASA) Issued 5 Feb. 1985 8 p Filed 14 Dec. 1983 Supersedes N84-22700 (22 - 13, p 1953) Division of US Patent Appl. SN-516217, filed 22 Jul. 1983
(NASA-Case-LEW-13770-5; NAS 1.71:LEW-13770-5; US-Patent-4,497,940; US-Patent-Appl-SN-561435; US-Patent-Class-526-262; US-Patent-Class-528-229; US-Patent-Class-528-322; US-Patent-Class-528-342; US-Patent-Appl-SN-516217) Avail: US Patent and Trademark Office CSCL 07D

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 C by controlling the available concentration of the maleic endcapped reactant. This control is achieved by adding sufficient amounts of said maleic reactant or by chemical modification of either copolymer, to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or hold initiation and polymerization to a rate compatible with the availability of the maleic capped reactant. Official Gazette of the U.S. Patent and Trademark Office

N85-21353 Department of the Navy, Washington, D. C.
FLUORINATED POLYURETHANES Patent
T. M. Keller, inventor (to Navy) Issued 16 Oct. 1984 5 p Supersedes AD-D011066
(AD-D011526; US-Patent-4,477,643; US-Patent-Appl-SN-602256; US-Patent-Class-528-70) Avail: US Patent and Trademark Office CSCL 11/9

Novel polymers and prepolymers are formed by reacting a fluorinated tertiary polyfunctional alcohol with an aliphatic diisocyanate or a biuret derivative of said diisocyanate in the presence of a suitable catalyst and in the absence of solvent. The novel polymers and prepolymers exhibit low surface energy properties and may be used in non-fouling coatings, foams and elastomers. GRA

N85-21354 Department of the Navy, Washington, D. C.
RUBBER MODIFIED EPOXY ADHESIVE Patent
D. J. Crabtree and E. Y. Park, inventors (to Navy) Issued 9 Oct. 1984 5 p
(AD-D011527; US-Patent-4,476,285; US-Patent-Appl-SN-471417; US-Patent-Class-525-113) Avail: US Patent and Trademark Office CSCL 11/1

A rubber-modified epoxy adhesive and the method of making the same is disclosed for use in bonding graphite-epoxy composite structures. The adhesive comprises a two-part formulation, one part being a reaction product of a carboxyl terminated reactive liquid rubber pre-reacted with a bisphenol. A epoxy resin so that linear epoxy-rubber chains are developed. The second part of the adhesive is an amine curing agent. One effective example of the adhesive is formulated as follows: approximately 4 parts by weight of the bisphenol A epoxy resin is mixed per part of a carboxyl terminated butadiene acrylonitrile rubber and heated to 170 deg C. At 160 deg C, a catalyst of approximately 0.01 parts by weight of triphenyl phosphene per part of the rubber is added and the mixture stirred for one hour at 170 deg - 175 deg C to provide the reaction product. After cooling to room temperature, the reaction product may be packaged in pre-measured quantities for mixture, when required, with a curing agent of cycloaliphatic diamine at a ratio of approximately 4:1. GRA

N85-21355*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL PROPERTIES OF BORON NITRIDE SYNTHESIZED BY ION BEAM DEPOSITION
Kazuhisa Miyoshi, Donald H. Buckley, and Talivaldis Spalvins 1985 15 p refs Proposed for presentation at the 12th Intern. Conf. on Met. Coatings, Los Angeles, 15-19 Apr. 1985; sponsored by the American Vacuum Society
(NASA-TM-86962; E-2459; NAS 1.15:86962) Avail: NTIS HC A02/MF A01 CSCL 11G

The adhesion and friction behavior of boron nitride films on 440 C bearing stainless steel substrates was examined. The thin films containing the boron nitride were synthesized using an ion beam extracted from a borazine plasma. Sliding friction experiments were conducted with BN in sliding contact with itself and various transition metals. It is indicated that the surfaces of atomically cleaned BN coating film contain a small amount of oxides and carbides, in addition to boron nitride. The coefficients of friction for the BN in contact with metals are related to the relative chemical activity of the metals. The more active the metal, the higher is the coefficient of friction. The adsorption of oxygen on clean metal and BN increases the shear strength of the metal - BN contact and increases the friction. The friction for BN-BN contact is a function of the shear strength of the elastic contacts. Clean BN surfaces exhibit relatively strong interfacial adhesion and high friction. The presence of adsorbates such as adventitious carbon contaminants on the BN surfaces reduces the shear strength of the contact area. In contrast, chemically adsorbed oxygen enhances the shear strength of the BN-BN contact and increases the friction. E.A.K.

N85-21356*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARAMETRIC EVALUATION OF BALL MILLING OF SIC IN WATER
James D. Kiser, Thomas P. Herbell, and Marc R. Freedman 1985 17 p refs Presented at the 9th Ann. Conf. on Composites and Advanced Ceramic Mater., Cocoa Beach, Fla., 20-23 Jan. 1985
(NASA-TM-86974; E-2399; NAS 1.15:86974) Avail: NTIS HC A02/MF A01 CSCL 11G

A statistically designed experiment was conducted to determine optimum conditions for ball milling alpha-SiC in water. The influence of pH adjustment, volume percent solids loading, and mill rotational speed on grinding effectiveness was examined. An equation defining the effect of those milling variables on specific surface area was obtained. The volume percent solids loading of the slurry had the greatest influence on the grinding effectiveness in terms of increase in specific surface area. As grinding effectiveness improved, mill and media wear also increased. Contamination was minimized by use of sintered alpha-SiC milling hardware.
Author

N85-21357*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARACTERIZATION OF LUBRICATED BEARING SURFACES OPERATED UNDER HIGH LOADS
James L. Lauer (Rensselaer Polytechnic Inst.), Norbert Marxer (Rensselaer Polytechnic Inst.), and William R. Jones, Jr. 1985 16 p refs Proposed for presentation at the Intern. Tribology Conf., Tokyo, 8-10 Jul. 1985; sponsored by the Japan Society of Lubrication Engineers
(Contracts AF-AFOSR-0005-81; DAAG24-83-K-0058)
(NASA-TM-86964; E-2462; NAS 1.15:86964) Avail: NTIS HC A02/MF A01 CSCL 11H

The composition and surface profiles of M-50 steel surfaces were measured after operation at high loads in a bearing contact simulator. An ester lubricant (trimethyolpropane triheptanoate) was used with and without various additives. Optical profiles were obtained + or - to 30 depth resolution with a phase-locked interference microscope in 10 micron diameter areas within and outside the wear tracks. Optical constants and surface film thickness were measured in the same areas with an electronic scanning ellipsometer. Film composition was measured with a scanning Auger electron spectrometer. It is concluded that metal oxide formation is accelerated within the wear tracks. E.A.K.

N85-21358*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION AND HOT CORROSION OF HOT-PRESSED Si3N4 AT 1000 DEG C
William L. Fielder Apr. 1985 25 p refs
(NASA-TM-86977; E-2419; NAS 1.15:86977) Avail: NTIS HC A02/MF A01 CSCL 11G

The oxidation and hot corrosion of a commercial, hot-pressed Si3N4 were investigated at 1000 C under an atmosphere of flowing O2. For the hot corrosion studies, thin films of Na2SO4 were airbrushed on the Si3N4 surface. The hot corrosion attack was monitored by the following techniques: continuous weight measurements, SO2 evolution, film morphology, and chemical analyses. Even though the hot corrosion weight changes after 25 hr were relatively small, the formation of SiO2 from oxidation of Si3N4 was an order of magnitude greater in the presence of molten Na2SO4. The formation of a protective SiO2 phase at the Si3N4 surface is minimized by the fluxing action of the molten Na2SO4 thereby allowing the oxidation of the Si3N4 to proceed more rapidly. A simple process is proposed to account for the hot corrosion process. E.A.K.

N85-21359*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HUMIDITY EFFECTS ON ADHESION OF NICKEL-ZINC FERRITE IN ELASTIC CONTACT WITH MAGNETIC TAPE AND ITSELF
Kazuhisa Miyoshi, Donald H. Buckley, Tomohide Kusaka (Osaka Inst. of Technology), and Chikayoshi Maeda (Osaka Inst. of Technology) Mar. 1985 10 p refs
(NASA-TP-2449; E-2361; NAS 1.60:2449) Avail: NTIS HC A02/MF A01 CSCL 11G

The effects of humidity on the adhesion of Ni-Zn ferrite and magnetic tape in elastic contact with a Ni-Zn ferrite hemispherical pin in moist nitrogen were studied. Adhesion was independent of normal load in dry, humid, and saturated nitrogen. Ferrites adhere to ferrites in a saturated atmosphere primarily from the surface tension effects of a thin film of water adsorbed on the ferrite surfaces. The surface tension of the water film calculated from the adhesion results was 48 times 0.00001 to 56 times 0.00001 N/cm; the accepted value for water is 72.7 x 0.00001 N/cm. The adhesion of ferrite-ferrite contacts increased gradually with increases in relative humidity to 80 percent, but rose rapidly above 80 percent. The adhesion at saturation was 30 times or more greater than that below 80 percent relative humidity. Although the adhesion of magnetic tape - ferrite contacts remained low below 40 percent relative humidity and the effect of humidity was small, the adhesion increased considerably with increasing relative humidity above 40 percent. The changes in adhesion of elastic contacts were reversible on humidifying and dehumidifying. Author

N85-21360*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR PREPARING HIGHLY OPTICALLY TRANSPARENT-COLORLESS ARMOMATIC POLYIMIDE FILM Patent Application
Anne K. St.Clair and Terry L. St.Clair, inventors (to NASA) Filed 23 Aug. 1984 21 p
(NASA-Case-LAR-13351-1; NAS 1.71:LAR-13351-1;
US-Patent-Appl-SN-643589) Avail: NTIS HC A02/MF A01 CSCL 11B

An aromatic condensation polyimide film that is approximately 90% transparent at 500 nm, useful for thermal protective coatings and the process for preparing same are disclosed. A feature to achieve maximum optical transparency films requires the utilization of recrystallized and/or sublimated specific aromatic diamines and dianhydride monomers and introduction bulky electron withdrawing groups and separator groups into the polymer molecular structure. The incorporation of bulky electron withdrawing groups in the diamine portion of the polymer structure serves to reduce the formation of interchain and intrachain charge transfer complexes which normally cause large absorptions in the UV visible range. Incorporation of separator atoms into either the diamine or dianhydride monomers serves to reduce the amount of conjugation and inter and intrachain electronic interactions to lessen charge transfer complex formation. NASA

N85-21361*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METAL (11) 4,4',4',4''-PHTHALOCYANINE TETRAAMINES AS CURING AGENTS FOR EPOXY RESINS Patent Application
Bappalige N. Achar (NAS-NRC, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Filed 11 Apr. 1984 17 p
(NASA-Case-ARC-11424-1; NAS 1.71:ARC-11424-1;
US-Patent-Appl-SN-598777) Avail: NTIS HC A02/MF A01 CSCL 11B

Metal, preferably divalent copper, cobalt or nickel, phthalocyanine tetraamines are used as curing agents for epoxides. The resulting copolymers have high thermal and chemical resistance and are homogeneous. They are useful as binders for laminates, e.g., graphite cloth laminate. NASA

N85-21362*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE RESISTANT POLYMERS BASED ON 1-[(DIORGANO OXYPHOSPHONYL)METHYL]-2,4- AND 2,6-DIAMINO BENZENES Patent Application
John A. Mikroyannidis (NAS-NRC, Washington, D.C.) and Demetrius A. Kourtides, inventors (to NASA) Filed 16 Aug. 1984 22 p
(NASA-Case-ARC-11512-2; NAS 1.71:ARC-11512-2;
US-Patent-Appl-SN-641153) Avail: NTIS HC A02/MF A01 CSCL 11B

The 1-[(diorgano oxyphosphonyl)methyl]-2,4 and -2,6-diamino benzenes are reacted with polyacylhalides and optionally comonomers to produce polyamides which have desirable heat and fire resistance properties. These polymers are used to form fibers and fabrics where fire and flame resistance properties are important, like aircraft equipment and structures. NASA

N85-21363*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE-RESISTANT PHOSPHORUS CONTAINING COMPOUNDS, POLYIMIDES AND COPOLYIMIDES Patent Application
John A. Mikroyannidis, inventor (to NASA) Filed 16 Aug. 1984 24 p
(NASA-Case-ARC-11522-2; NAS 1.71:ARC-11522-2; US-Patent-Appl-SN-641143) Avail: NTIS HC A02/MF A01 CSCL 11B

Phosphorus containing polyimides and copolyimides are synthesized in a two step polycondensation reaction from 1-[(diorgano oxyphosphonyl)methyl]-2,4- and -2,6-diaminobenzenes and tetracarboxylic anhydride. The diorgano position of the diorganooxyphosphonyl group includes alkyl, such as ethyl, substituted alkyl, such as s 2-chloroethyl, and aryl such as phenyl. The tetracarboxylic anhydrides include compounds such as pyromellitic dianhydride and benzophenone tetracarboxylic dianhydride. The glass transition temperature of the polyimides is reduced by incorporation of the (dialkoxyphosphonyl)methyl groups. Both the molecular weight and the thermal stability of the polymers are reduced with increasing concentration of the phosphorus moieties. The phosphorus containing copolyimides show a considerably higher dgree of fire resistance as compared to that of the corresponding common polyimides, and can be used in matrix composites composites in very thermally stable high temperature graphite composites for aircraft applications. NASA

N85-21364*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE AND HEAT RESISTANT LAMINATING RESINS BASED ON MALEIMIDO AND CITRACONIMIDO SUBSTITUTED 1-[(DIORGANO OXYPHOSPHONYL)METHYL]-2,4- AND 2,6-DIAMINOBENZENES Patent Application
John A. Mikroyannidis (NAS-NRC, Washington, D.C.) and Demetrius A. Kourtides, inventors (to NASA) Filed 16 Aug. 1984 30 p
(NASA-Case-ARC-11533-1; NAS 1.71:ARC-11533-1; US-Patent-Appl-SN-641147) Avail: NTIS HC A03/MF A01 CSCL 11B

A novel class of fire and heat resistant bisimide resins prepared by thermal polymerization of maleimido or citraconimido substituted 1-[(dialkox phosphonyl)methyl]-2-4 and -2,6-diamino benzene was presented. The polymer precursors are prepared by reacting 1-[(diorgano oxyphosphonyl)methyl]-2-4- and -2,6-diamino benzenes with maleic anhydride or citraconic anhydride in a mole ratio 1:2. Chain extension of the monomers is achieved by reacting the mono-N-maleimido derivaties of 1-[(diorgano oxyphosphonyl)methyl]-2,4 and -2,6-diaminobenzenes with aryl tetracarboxylic dianhydrides, such as benzophenone tetracarboxylic dianhydride, or aryl diisocyanates, such as methylenebis (4-phenylisocyanate), in a mole ratio 2:1. The polymerization of the monomers is studies by differential scanning calorimetry (DSC) and the thermal stability of the polymers is ascertained by thermogravimetric analysis (TGA). NASA

N85-21365# Southwest Research Inst., San Antonio, Tex.
A STUDY OF INTUMESCENT REACTION MECHANISMS Final Report, May 1983 - Jul. 1984
C. E. Anderson, Jr., J. Dziuk, Jr., and J. Buckmaster Warminster, Pa. Naval Air Development Center Aug. 1984 130 p
(AD-A149605; SwRI-7557; NADC-84170-60) Avail: NTIS HC A07/MF A01 CSCL 11/3

An extensive experimental program has been conducted on intumescent systems where the components have been systematically varied. Small plates were coated with the various formulations, exposed to a heat source typical of aviation fuel fires, and the temperature-time history of the substrate recorded. Concurrently, a simplified mathematical model was developed for an intumescing system which has given insight to the fundamental mechanisms of intumescence. The model and the results of the experimental program demonstrated certain desirable features of intumescent systems and hold the promise of guiding the optimization of certain promising formulations to thermally protect Navy ordnance. GRA

N85-21366# Army Construction Engineering Research Lab., Champaign, Ill.
CORROSION AND COATINGS REVIEW OF SPECIFICATIONS AND DRAWINGS OF FACILITIES FOR THE OMAN MILITARY CONSTRUCTION PROGRAM AT MASIRAH ISLAND, OMAN Final Report
R. Lampo, A. Kumar, V. Hock, V. Healy, and R. Weber Dec. 1984 68 p
(AD-A149739; CERL-SR-M-85/07) Avail: NTIS HC A04/MF A01 CSCL 11/3

The objective of this report is to review existing specifications and drawings for Middle East construction and to evaluate corrosion and coatings problems specific to the Oman Military Construction Program at Masirah Island, Oman. This work will form the basis for recommending additions and changes to the specifications and drawings, which would apply to all similar environments. The review included: (1) evaluation of atmospheric, underground, and seawater corrosivity at Masirah Island; (2) evaluation of corrosion control (cathodic protection, material selection) and coatings systems that have been specified for facilities components; (3) consideration of additional or alternative corrosion control measures or coatings needed since most of the current construction has been completed or is near completion; and (4) recommendations to include lessons learned from previous Corps of Engineers construction work in Saudi Arabia. The report is divided into two major sections: (1) recommendations and comments on the specifications and drawings for the FY81 and FY82 program and (2) recommendations and comments on the specifications and drawings for the FY83 program. Each major section is subdivided into three basic parts: (1) items requiring immediate attention, (2) items to consider for future construction and maintenance needs, and (3) suggestions for the maintenance or rehabilitation of deteriorating items or structures already in place. GRA

N85-21367# IIT Research Inst., Chicago, Ill. Mechanics of Materials Research Div.
EVALUATION OF CORROSION-EROSION BEHAVIOR OF VARIOUS CERAMIC MATERIALS Final Report, 1 Sep. 1980 - 30 Jun. 1983
J. W. Adams and D. C. Larsen Wright-Patterson AFB, Ohio AFWAL Jun. 1984 347 p
(Contract F33615-79-C-5100)
(AD-A149756; IITRI-MO6054-47; AFWAL-TR-84-4067) Avail: NTIS HC A15/MF A01 CSCL 11/2

Baseline and simulated environment post-exposure test results of fourteen candidate ceramic materials for stationary power-generating gas turbines are presented. The materials studied were various material types of silicon nitride, silicon carbide, aluminum nitride, Al2O3-ZrO2, Al2O3-SiC, MgAl2O4 spinel, and SiAlON. One dynamic (1425 deg C, 305 m/s, 1000 hr) and nine static (1000 deg, 1200 deg, and 1425 deg C for 100, 300, and 1000 hr) exposures were conducted at the Morgantown Energy Technology Center facility of the Department of Energy. The exposure environment was coal-derived fuel gas combustion products created in a fixed-bed gasification system. Post-exposure evaluation involved evaluation of surface chemistry and morphology, weight and dimension change, retained room-temperature strength and fracture surface analysis. Based upon limited testing and the small sample population available, the materials are ranked according to their probable survivability in power turbine applications. GRA

N85-21368# Materials Research Labs., Ascot Vale (Australia).
INTERACTIONS BETWEEN F-111 FUSELAGE FUEL TANK SEALANTS. PART 2: VARIATION IN PERFORMANCE PROPER-

TIES OF POLYSULFIDES AFTER CONTACT WITH POLYESTER DEGRADATION PRODUCTS
P. J. Hanhela and D. B. Paul Aug. 1984 39 p
(AD-A149777; MRL-R-658) Avail: NTIS HC A03/MF A01 CSCL 11/1

Fuel leaks occur in F-111 aircraft from interactions between polysulfide sealants and the hydrolysis products of polyester sealants used to seal fuel cavities. Changes in properties of some polysulfides were examined following contact with degraded polyesters. Use of model degradation compounds indicated that ester groups cause swelling, alcohols suppress swelling when used with esters, and carboxylic acids both swell the polysulfides and harden exposed surfaces. Degraded polyesters cause swelling and embrittlement together with inner softening of the polysulfides. PR-1750, which has a high crosslink density, was the most resistant of the polysulfides examined. Studies with simulated fuel tank structures indicated that the polysulfides ruptured due to expansion pressures acting on a matrix weakened by swelling. Such pressures arise from swell of the polyester sealants and thermal expansion of their degradation products under aerodynamic heating. For small contact areas between polyester and polysulfide, adhesion was relatively unaffected. Broad sealant fillets were shown to be essential for effective resealing over extended periods. Author (GRA)

N85-21369# Lehigh Univ., Bethlehem, Pa. Materials Research Center.
DEGRADATION MECHANISMS IN CERAMIC DIELECTRICS Interim Report, 1 May 1983 - 31 Jul. 1984
D. M. Smyth and M. P. Harmer Aug. 1984 80 p
(Contract N00014-82-K-0190)
(AD-A149791; Rept-32; IR-2) Avail: NTIS HC A05/MF A01 CSCL 09/1

This program is designed to identify the mechanisms that lead to leakage current degradation in BaTiO3-based dielectrics subjected to voltage-temperature stress, and to determine those factors that contribute to stability against such degradation. During the first year, it was confirmed that BaO-rich and donor-doped compositions are particularly stable, and that grain-size is a relatively unimportant parameter. During the second year of investigation, the microstructures of a BaO-rich and donor-doped BaTiO3 have been examined in detail in an effort to determine the reasons for their pronounced stability. In addition, the effect of porosity, both in amount and morphology, has been found to be an important factor. GRA

N85-21370# Naval Surface Weapons Center, White Oak, Md.
SCALE-UP OF VANADIUM TRINEODECANOATE Final Report, Jun. 1980 - 84
R. E. Farncomb 1 Feb. 1984 47 p
(AD-A149935; NSWC/TR-84-150) Avail: NTIS HC A03/MF A01 CSCL 11/9

Vanadium trineodecanoate (VND) is one of the promotor components of the fiberglass-reinforced plastic required for the Marine Corps' flexible membrane surfacing for soils. A synthesis procedure for VND, developed by the Naval Weapons Center, China Lake, was scaled up by a factor of 20 to produce 15-kg batches of the material. Since the VND-product solution is compatibile with the by-product hydrochloric acid, it is necessary to complete the reaction within 6 hours after the addition of the neodecanoic acid. The minimum cost for VND solution prepared at the 15-kg batch level is $25/kg. It is calculated that a process based on a continuous flow reactor with a capacity of 10 kg/hr could produce the VND solution at a cost of $10/kg. In a much larger continuous reactor, the price for VND would drop to about $4/kg. GRA

N85-21371# Salford Univ. (England). Dept. of Pure and Applied Physics.
MICROSTRUCTURAL AND ELECTRONIC CHARACTERISTICS OF METALLIC SPIN GLASSES Final Scientific Report, 1 Oct. 1983 - 30 Sep. 1984
A. J. Janicki and R. S. Tebble 15 Nov. 1984 20 p
(Grant AF-AFOSR-0005-80)
(AD-A149959; AFOSR-84-1237TR) Avail: NTIS HC A02/MF A01 CSCL 11/2

In the report, the structural relaxation process of Fe10Ni-65B15Si10 amorphous spin glass is described. The ribbon samples were prepared by melt spinning and heat treated using two different annealing processes AP1 and AP2. The techniques employed to investigate structural changes in the three alloy states AQ (as-quenched), AP1 and AP2 were as follows: transmission electron microscopy, scanning electron microscopy with X-ray analysis, differential scanning calorimetry and density determination. Differences were detected in the amorphous structures for two states of relaxation in the alloy. The formation of clusters is proposed for one alloy state and the influence of clustering on the early stages of crystallization is discussed. GRA

N85-21372# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymer Branch.
SYNTHESIS AND THERMOMECHANICAL PROPERTIES OF NEW AT-PHENYLENE R SYSTEMS Final Report, 1 Sep. 1982 - 30 Nov. 1983
J. S. Wallace and F. E. Arnold Wright-Patterson AFB, Ohio AFWAL Aug. 1984 62 p
(AF Proj. 2303)
(AD-A149961; AFWAL-TR-84-4046) Avail: NTIS HC A04/MF A01 CSCL 11/9

A series of high molecular weight (550-700 amu range) bis-phenol based acetylene terminated (AT) resins were synthesized by reacting four moles of 4,4'dihalodiphenylsulfone (chloro and fluoro) with one mole of a bis-phenol (4,4'-isopropylidinediphenol, 4,4'-thiodiphenol, p,p'-biphenol, and resorcinol were used), end-capping the resulting halo-terminated products with 4-(m-hydroxyphenyl)-2methyl-3butyn-2-ol, and caustically cleaving the terminal acetone protecting groups to give free ethynyl functionalities. This synthesis produces a mixture of monomer and oligomer AT-products which were separated by column chromatography. Structural characterization of the systems was based on elemental and spectrographic (infrared and nuclear magnetic resonance (1H)) analyses. Pure AT-monomers and the monomer/oligomer mixtures produced by the outlined stoichiometry were cured at 288 C (550 F) for 8 h in air. Glass transition temperatures (Tgs) of the cured (by thermomechanical analysis) and uncured (by differential scanning calorimetry) AT-systems were measured. Thermo-oxidative stability of the resins was evaluated by isothermal aging (ITA) in air at 315 C (600 F) for 200 h. GRA

N85-21373# Rheology Research, Gaithersburg, Md.
RHEOLOGY OF DISSEMINATION Contract Report, Jun. 1983 - Jun. 1984
E. A. Kearsley Oct. 1984 20 p
(Contract DAAK11-83-C-0040)
(AD-A150006; CRDC-CR-84097) Avail: NTIS HC A02/MF A01 CSCL 20/4

Although large extensional flow components occur in many technological processes of liquids, there is no currently suitable device to measure the elongational properties of polymer solutions. This report describes a possible method of inferring extensional fluid properties by determining the nonlinear, time-dependent mechanical properties of concentrated solutions of polymers from stress relaxation in torsion measurements. This method is based on the BKZ model of an isothermal elastic fluid with an elastic potential function of the Valanis Landel type. GRA

N85-21374# Kentucky Univ., Lexington. Dept. of Chemistry.
THEORETICAL STUDIES ON N-BONDED PYRAZOLE DERIVATIVES OF BORON
A. L. Companion, F. Liu, and K. Niedenzu Jan. 1985 17 p
(Contract N00014-83-K-0611)
(AD-A150036; UK/DC/TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/3

Complete neglect of Differential Overlap (CNDO) calculations on the sequential processes (1) R2BH + Hpz yield R2Bpz + H2; (2) 2 R2Bpz yields R 2 B (Mu-pz)2BR2 (where pz = pyrazolyl =

N2C3H3) indicate that for R = H both steps are energetically favorable, particularly the dimerization (2). In addition, the latter also leads to electronic saturation of the boron atom; and the energy of the resultant pyrazabole is independent of the conformation of the molecule. For R = 1/2 CH3N-(CH2)2-NCH3, only step (1) yielding the monomer is exothermic, whereas (2) is greatly dependent on the geometry of the central B2N4 ring (in addition to provoking a considerable charge increase on the boron atom). Another process, i.e., (3) R2Bpz + Hpz yields R2B(Mu-pz)2H, is exothermic in both cases, but for R = H the pyrazabole formation (2) is much more strongly favored. The theoretical data are in good agreement with experimental results. GRA

N85-21375# California Univ., Santa Barbara. Dept. of Physics.
CONTROL OF ELECTRONIC, MAGNETIC AND OPTICAL PROPERTIES OF DOPED POLYACETYLENE CONDUCTORS Final Report, 1 Sep. 1982 - 31 Aug. 1984
Alan J. Heeger 15 Nov. 1984 8 p
(Contract DAAG29-82-K-0177)
(AD-A150117; ARO-19775.3-MS) Avail: NTIS HC A02/MF A01 CSCL 11/9

The electronic properties of the novel class of conducting polymers have been investigated using a variety of techniques. Studies during the period of this grant focused on polyacetylene (a conjugated polymer with a degenerate ground state) and polythiophene (an analogous polymer in which the ground state degeneracy has been lifted). Photoinduced absorption and photoinduced ESR studies were carried out on these polymers. In addition an extensive study of the effects of radiation damage on (CH)x and (CD)x was completed. The construction of a versatile X-ray scattering apparatus was completed and the instrument was used to study the charge density wave state in a quasi-one-dimensional conductor. GRA

N85-21376# Los Alamos Scientific Lab., N. Mex.
SIMPLE EOS FOR THE SILICONE RUBBER SYLGARD 184
F. Dowell Aug. 1984 16 p refs
(Contract W-7405-eng-36)
(DE85-001394; LA-10164-MS) Avail: NTIS HC A02/MF A01

A simple equation of state (EOS) for the silicone rubber Sylgard 184 initial state density rho0 = 1.05 g/sq cm is presented and added to the T-4 Sesame EOS Library as material number 7930 Sylgard 184 is a room temperature vulcanizing (RTV) silicon rubber. The EOS reproduces the experimental shock Hugoniot data for Sylgard. DOE

N85-21377# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
EFFECT OF ULTRAVIOLET RADIATION ON TRANSPARENT POLYMER FILMS AS DETERMINED USING IN SITU FTIR-RA SPECTROSCOPY. VOLUME 1: PHOTODEGRADATION OF TRANSPARENT POLYMER FILMS
John D. Webb Aug. 1984 43 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013039; SERI/TR-255-2177-Vol-1) Avail: NTIS HC A03/MF A01

The application of Fourier transform infrared reflection absorption (FTIR-RA) spectroscopy to the in situ study of the effects of ultraviolet radiation on polymeric materials proposed for use in passive solar heating and cooling systems is demonstrated. The method permits collection of the infrared reflection absorption spectrum of a polymer film on an IR reflective substrate while the sample is exposed to simulated outdoor conditions. Preliminary studies of two materials (polycarbonate and poly(methyl methacrylate)) with potential for glazing applications are described. Qualitative information on photodegradation reaction mechanisms is obtained, quantum yields for some reactions are determined, and it is shown that they are comparable to literature values. DOE

N85-21378# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
IMPROVEMENTS IN GLAZINGS: SERI MATERIALS RESEARCH IN PROGRESS
Thomas F. Potter Jul. 1984 14 p refs Presented at the Am. Council for an Energy Efficient Economy, Santa Cruz, Calif., 14-22 Aug. 1984
(Contract DE-AC02-83CH-10093)
(DE84-013049; SERI/TP-251-2413; CONF-840819-11) Avail: NTIS HC A02/MF A01

Progress in two areas with significant long term potential for improving the thermal performance of apertures was evaluated. Removing interglazing gases may greatly reduce the conductive/convective thermal transfer through multiple pane glazings. Evacuated glazings show the expected high resistance to thermal conductance and convection; laboratory scale demonstration units were produced with laser sealed edges. Another approach addresses the possibility of electrically controlling the transmission of solar radiation through windows. Electrochromic glazings can be operated by low voltage switching to adjust the visual and infrared transmittance of the aperture. Both concepts are discussed in relation to: (1) the overall goal of greatly reducing unwanted gains and losses through windows; and (2) the commercially available alternatives to these concepts. Optimal characteristics and recent technical advances are analyzed. DOE

N85-21379# Battelle Columbus Labs., Ohio.
MULTIAXIAL STRESS RESPONSE OF CERAMICS Progress Report, 16 May - 30 Nov. 1984
A. R. Rosenfield, W. H. Duckworth, and D. K. Shetty 1 Dec. 1984 4 p
(Grant DE-FG02-84ER-45073)
(DE85-004350; BMI-2118) Avail: NTIS HC A02/MF A01

Room temperature research was conducted on the strength of ceramics containing flaws associated with hardness indentations. Creep literature revealed that even uniaxial bending presents problems in data reduction due to complex stress profiles. DOE

N85-21380# Bayer A.G., Leverkusen (West Germany).
POLYMER INTERMEDIATES FROM LIMONENE (FOLLOW-UP PROJECT) Final Report, Sep. 1983
Gerhard Klein Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 14 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-243; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 3

A diamine and diisocyanate were produced starting from limonene. The renewable raw material limonene is oxidized to carvone or dihydrocarvone, and subsequently transformed to unsaturated or saturated ketoaldehyde. A diamine is obtained by reductive animation, and a diisocyanate by subsequent phosgenation. This diamine and diisocyanate can replace isophorone diamine (IPDA) and isophorone diisocyanate (IPDI) in most applications. However, they do not have substantial advantages. In order to compete economically with IPDA and IPDI, the manufacturing costs of the diamine and diisocyanate have to be lower than for IPDA and IPDI. Author (ESA)

N85-21381# National Bureau of Standards, Gaithersburg, Md. National Engineering Lab.
FINE-GRAINED, ISOTROPIC GRAPHITE FOR USE AS NBS (NATIONAL BUREAU OF STANDARDS) THERMOPHYSICAL PROPERTY RM'S FROM 5 TO 2500 K Final Report
J. G. Hust Sep. 1984 120 p refs
(PB85-112886; NBS/SP-260/89; LC-84-601106) Avail: NTIS HC A06/MF A01; SOD HC as SN003-003-02608-5 CSCL 07D

Graphite as a potential, extended temperature range, research material (RM) was investigated. A large number of isotropic, fine-grained graphite rods in various diameters were obtained. In phase 1, electrical resistivity and density measurements were performed on numerous rods at temperatures from 4 to 300 K. In phase 2, thermal conductivity measurements were performed on 13 specimens at about 20C. In phase 3, a large number of specimens were characterized for room temperature electrical

resistivity and density. Phase 4 describes the results of the measurements from the various participants. Phase 5 describes the analysis of these data. GRA

N85-21382# Argonne National Lab., Ill. Materials Science and Technology Div.
CHARACTERIZATION AND OPTIMIZATION OF POLYETHYLENE RESINS AND GAS PIPE
J. E. Battles, L. A. Raphaelian, D. T. Raske, and G. Ettinger Jun. 1984 84 p refs Sponsored in part by Gas Research Inst.
(PB85-118511; GRI-84/0108) Avail: NTIS HC A05/MF A01 CSCL 11I

The general objective of this project is to analyze and characterize the molecular structure of polyethylene (PE) resins and to determine and correlate the effects of copolymerization (including type, nature, and concentration of monomers and type and extent of copolymer branching) on the morphology and the physical and mechanical properties of commercially available PE pipe material for gas distribution. The ultimate purpose of the activity is to characterize the desirable and undesirable monomer additives and properties in available PE resins for pipe - and to use this information to control, improve, and optimize the desirable physical and mechanical properties of PE resins for long-term performance in gas pipe and piping systems. GRA

N85-21383# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS. VOLUME 1: SUMMARY AND CONCLUSIONS Final Planning Report
Aug. 1984 79 p refs 6 Vol.
(Contract NB82-SBCA-1637)
(PB85-113082; CRA-684-Vol-1; NBS/GCR-84/470/1; PR-19) Avail: NTIS HC A05/MF A01 CSCL 11B

A technology deal and economic assessment of advanced ceramic materials is presented. Specific applications are examined. The applications are heat engines, capacitors, integrated optics, gas sensors, and cutting tools. The assessments include current and projected trends in technological advances and the economic impacts in terms of rate and directions of growth of the relevant markets. GRA

N85-21384# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS. VOLUME 2: A CASE STUDY OF CERAMICS IN HEAT ENGINE APPLICATIONS Final Planning Report
Aug. 1984 103 p refs 6 Vol.
(Contract NB82-SBCA-1637)
(PB85-113090; CRA-684-Vol-2; NBS/GCR-84/470/2; FR-19-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 11B

The technological issues involved in the application of ceramics to heat engines are reviewed. The market for heat engines and components is discussed and the potential social benefits of the use of ceramics in heat engines are assessed. GRA

N85-21385# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS: VOLUME 4: A CASE STUDY OF INTEGRATED OPTIC DEVICES Final Report
Aug. 1984 66 p refs
(Contract NB82-SBCA-1637)
(PB85-113116; CRA-684-Vol-4; NBS/GCR-84/470/4-Vol-4; Rept-19-Vol-4) Avail: NTIS HC A04/MF A01; also available in set of 6 reports HC E99 as PB85-113074 CSCL 11B

A technology and economic assessment of advanced ceramic materials is reported. The applications are heat engines, capacitors, integrated optics, gas sensors, and cutting tools. The assessments include current and projected trends in technological advances and the economic impacts in terms of rate and directions of growth of the relevant markets. GRA

N85-21386# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS. VOLUME 5: A CASE STUDY OF CERAMIC TOXIC AND COMBUSTIBLE GAS SENSORS Final Planning Report
Aug. 1984 67 p refs 6 Vol.
(Contract NB82-SBCA-1637)
(PB85-113124; CRA-684-Vol-5; NBS/GCR-84/470/5-Vol-5; FR-19) Avail: NTIS HC A04/MF A01 CSCL 11B

An overview of ceramic sensors is provided. Ceramic gas sensor technology is discussed as well as the world ceramic industry and the potential economic impacts of technological change. GRA

N85-21387# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS. VOLUME 6: A CASE STUDY OF CERAMIC CUTTING TOOLS Final Report
Aug. 1984 79 p refs
(Contract NB82-SBCA-1637)
(PB85-113132; CRA-684-Vol-6; NBS/GCR-84/470/6-Vol-6) Avail: NTIS HC A05/MF A01; also available in set of 6 reports HC A E99 as PB85-113074 CSCL 11B

A background of advanced ceramic cutting tool technology is discussed and the major technical barriers to commercial diffusion of these tools are considered. The advanced ceramic cutting tool industry is reviewed. The purpose is to provide background material for discussions of the potential benefits of advanced ceramic cutting tools and international competitiveness. An analysis of the potential social benefits of advanced ceramic cutting tools is presented. GRA

N85-21388# Texas A&M Univ., College Station. Food Protein Research and Development Center.
PROCESS DEVELOPMENT FOR COMMERCIAL PRODUCTION OF NATURAL RUBBER FROM GUAYULE Final Report
C. R. Engler and D. McIntyre (Akron Univ.) Feb. 1984 151 p refs
(Grants EDA-RED-785-G-82-2; EDA-99-7-13594)
(PB85-124956; EDA/RED-84-43) Avail: NTIS HC A08/MF A01 CSCL 11J

Results from the first year of a projected 3 year effort to develop design specifications for a pilot plant to extract natural rubber from guayule are presented. The results provided a basis for construction of a semicontinuous facility for solvent extraction of text quantities of rubber. Major accomplishments include selection of a simultaneous solvent extraction process for detailed laboratory studies, evaluation of solvents for this process which resulted in the selection of perchloroethylene and ethanol for use in the semiccontinuous extraction facility, selection of a mechanical press for separation of the rubber/solvent solution from plant tissue and preliminary studies of shrub preparation methods. It is determined that unsaturated fatty acids are detrimental to rubber, causing its degradation during long-term storage; however, fine plant tissue apparently is not detrimental to physical properties of rubber products. GRA

N85-21389# National Materials Advisory Board, Washington, D.C.
HIGH-TECHNOLOGY CERAMICS IN JAPAN Final Report
1984 69 p refs
(Grants EDA-RED-800-G-83-2; EDA-99-7-13608)
(PB85-125029; NMAB-418; EDA/RED-84-44) Avail: NTIS HC A04/MF A01 CSCL 11A

High technology ceramics are made from extremely pure, composition controlled, ultraminute particles formed, sintered, and treated under closely regulated conditions. These properties and processes give superior performance characteristics that allow the materials to be used in a wide range of demanding applications far beyond the capabilities of conventional ceramics. Japan is widely viewed as having a significant national commitment to developing and exploiting high technology ceramics in order to advance its domestic and international markets. The findings of a committee formed to assess the situation in Japan with the objective of providing an understanding of the possible effects on

high technology ceramics in the United States are presented. The greatest potential for application of this technology appears to be in the automobile and electronics industries. The committee recommends several steps that should be taken in the United States to advance the field of high technology ceramics, particularly in view of the effort now taking place in Japan. GRA

N85-21459# Brunswick Corp., Marion, Va. Defense Div.
A BROADBAND KEVLAR RADOME FOR SHIPBOARD
J. B. Styron and R. S. Francisco *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 135-144 (For primary document see N85-21444 12-32)
(AD-P004365) Avail: NTIS HC A12/MF A01 CSCL 17/4

N85-21460# Army Materials and Mechanics Research Center, Watertown, Mass.
FIBER REINFORCED FUSED SILICA FOR HYPERSONIC RADOME APPLICATIONS
F. P. Meyer, G. D. Quinn, and J. C. Walck *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), part 2 1984 p 145-157 (For primary document see N85-21444 12-32)
(AD-P004366) Avail: NTIS HC A12/MF A01 CSCL 17/9

N85-21461# GTE WESCO Technical Ceramics and Metals, Belmont, Calif.
PRESSURELESS SINTERED SILICON NITRIDE AS A PROMISING CANDIDATE FOR RADOME MATERIALS
M. Y. Hsieh, H. Mizuhara, and P. W. Smith *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 159-165 (For primary document see N85-21444 12-32)
(AD-P004367) Avail: NTIS HC A12/MF A01 CSCL 17/9

N85-21462# Brunswick Corp., Marion, Va. Defense Div.
LL-100: A NEW POLYBUTADIENE (RESIN SYSTEM FOR RADOME APPLICATIONS)
G. W. Eastridge *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 167-175 (For primary document see N85-21444 12-32)
(AD-P004368) Avail: NTIS HC A12/MF A01 CSCL 17/9

N85-21463# Texas Instruments, Inc., Dallas.
BROADBAND THERMOPLASTIC RADOMES
K. Hollenbeck and M. Rehrl *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 177-185 (For primary document see N85-21444 12-32)
(AD-P004369) Avail: NTIS HC A12/MF A01 CSCL 17/9

N85-21464# GTE Labs., Inc., Waltham, Mass.
PROGRESS ON TRANSPARENT YTTRIA
W. H. Rhodes and E. A. Trickett *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 187-194 (For primary document see N85-21444 12-32)
(Contract N00014-82-C-0452)
(AD-P004370) Avail: NTIS HC A12/MF A01 CSCL 11/2

N85-22212*# Alabama A & M Univ., Normal. Dept. of Chemistry.
SRM FILAMENT WOUND CASE RESIN CHARACTERIZATION STUDIES
Libby W. Chou *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 19 p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11G

N85-22216*# Calhoun Community Coll., Decatur, Ala. Dept. of Natural Sciences.
INVESTIGATION OF FOAM FLOTATION AND PHASE PARTITIONING TECHNIQUES
Ben L. Currin *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 15 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11G

N85-22236*# Alabama Univ., Huntsville. Dept. of Electrical and Computer Engineering.
NEW RESULTS ON THE PLL FALSE LOCK PHENOMENON
John L. Stensby *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 26p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 12A

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-21390 Department of the Air Force, Washington, D.C.
PLASTICIZER SYSTEM FOR PROPELLANT COMPOSITIONS Patent
W. D. Stephens and B. K. Rodman, inventors (to Air Force) Issued 13 Nov. 1984 3 p
(AD-D011502; US-Patent-4,482,408; US-Patent-Appl-SN-497456; US-Patent-Class-149-19.4) Avail: US Patent and Trademark Office CSCL 21/9

In accordance with this invention, there is provided a compound which acts effectively as a plasticizer for propellant compositions without the attendant problems of plasticizer migration which occur during propellant storage. The plasticizer is a carbamic acid ester. The primary objectives of this invention are to provide: a carbamic acid ester having a particular molecular structure; solid propellant composition that produces only minimum amounts of plasticizer migration during its shelf-life; and a carbamic acid ester that finds particular utility as an internal plasticizer for solid propellant compositions. B.G.

N85-21391 Department of the Air Force, Washington, D.C.
PLASTICIZER SYSTEM FOR PROPELLANT COMPOSITIONS Patent
W. D. Stephens and L. E. Jones, inventors (to Air Force) Issued 13 Nov. 1984 4 p
(AD-D011508; US-Patent-4,482,410; US-Patent-Appl-SN-497458; US-Patent-Class-149-19.4) Avail: US Patent and Trademark Office CSCL 21/9

In accordance with this invention, there is provided a family of compounds which act effectively as plasticizers for propellant compositions without the attendant problems of plasticizer migration which often arise during propellant storage. The plasticizers are polyethers. The primary objectives of this invention are to provide: a family of polyether plasticizers having a particular molecular structure; a solid propellant composition that produces only minimum amounts of plasticizer migration during its shelf-life; and a family of pivalate ether plasticizers that find particular utility as internal plasticizers for solid propellant compositions. B.G.

N85-21392 Department of the Air Force, Washington, D.C.
AZIDO NITRAMINO ETHER CONTAINING SOLID PROPELLANTS Patent
E. F. Witucki and J. E. Flanagan, inventors (to Air Force) Issued 13 Nov. 1984 3 p
(AD-D011511; US-Patent-4,482,404; US-Patent-Appl-SN-558675; US-Patent-Class-149-19.1) Avail: US Patent and Trademark Office CSCL 21/9

A family of azido nitramino ethers which are energetic liquids find particular utility as energetic plasticizers in advanced solid propellants. These include bis (2-azidoethoxymethyl) nitramine (MNDA) and 1, 12-diazido-3,10-dioxa-5, 8-dinitrazadodecane (DDDD). Two examples of this family of amines are represented and were found to be unexpectedly effective in overcoming the problem of flame in the exhaust gases produced during the operational phase of a solid propellant composition. The primary objectives of this invention are to provide: a family of azido nitramino

ethers; a solid propellant composition that produces only minimum amounts of flame during its operational phase; and family of azido nitramino ethers that find particular utility as energetic plasticizers for advanced solid propellant compositions. GRA

N85-21393 Department of the Air Force, Washington, D.C.
PLASTICIZER SYSTEM FOR PROPELLANT COMPOSITIONS Patent
W. D. Stephens and B. K. Rodman, inventors (to Air Force) Issued 13 Nov. 1984 4 p
(AD-D011514; US-Patent-4,482,409; US-Patent-Appl-SN-497457; US-Patent-Class-149.19.4) Avail: US Patent and Trademark Office CSCL 21/9

In accordance with this invention, there is provided a compound which acts effectively as a plasticizer for propellant compositions without the attendant problems of plasticizer migration which often arise during propellant storage. The plasticizer is a linoleate ester. The primary objectives of this invention are to provide: a novel linoleate ester plasticizer having a particular molecular structure. Another object of this invention is to molecular structure; a solid propellant composition that produces only minimum amounts of plasticizer migration during its shelflife; and a linoleate ester that finds particular utility as an internal plasticizers for solid propellant compositions. B.G.

N85-21394 Department of the Air Force, Washington, D.C.
PLASTICIZER SYSTEM FOR PROPELLANT COMPOSITIONS Patent
W. D. Stephens and L. E. Jones, inventors (to Air Force) Issued 13 Nov. 1984 4 p
(AD-D011516; US-Patent-4,482,411; US-Patent-Appl-SN-497459; US-Patent-Class-149-19.4) Avail: US Patent and Trademark Office CSCL 21/9

The present invention discloses the preparation of a family of polytetramethyleneglycol monooctaneoate ester-ethers and their use as internal plasticizers for propellent compositions. GRA

N85-21395 Department of the Air Force, Washington, D.C.
PLASTICIZER SYSTEM FOR PROPELLANT COMPOSITIONS Patent
W. D. Stephens and B. K. Rodman, inventors (to Air Force) Issued 13 Nov. 1984 4 p
(AD-D011517; US-Patent-4,482,407; US-Patent-Appl-SN-497445; US-Patent-Class-149.19.4) Avail: US Patent and Trademark Office CSCL 21/9

In accordance with this invention, there is provided a compound which acts effectively as a propellant plasticizer without the attendant problems of plasticizer migration that often occur during propellant storage. The plasticizer of this invention is carbamic acid ester. The primary objectives of this invention are to provide: a carbamic acid ester plasticizer having a particular molecular structure; a solid propellant composition that produces only minimum amounts of plasticizer migration during its storage shelf-life; a carbamic acid ester that finds particular utility as an internal plasticizer for solid propellant compositions. B.J.

N85-21396 Department of the Army, Washington, D. C.
AMINE SALTS AS BONDING AGENTS Patent
M. E. Ducote and H. C. Allen, inventors (to Army) Issued 15 Jan. 1985 6 p Supersedes AD-D010324
(AD-D011543; US-Patent-4,493,741; US-Patent-Appl-SN-488249; US-Patent-Class-149-19.4) Avail: US Patent and Trademark Office CSCL 21/9

The polyamine compound, TEPAN, a partially cyanoethylated tetraethylene pentamine, is reacted with a selected ammonium salt to form an adduct of TEPAN and the selected ammonium salt. The ammonium salt is selected from ammonium perchlorate (AP), ammonium nitrate (AN), ammonium sulfate (AS), and ammonium formate (AF). The process for preparation of the adduct comprises reacting a water solution of the selected ammonium salt with TEPAN while stirring at room temperature. A TEPAN-glycidol derivative product is also reacted with the selected oxidizer salt to form an adduct of the TEPAN-glycidol derivative product. The disclosed adducts improve mechanical properties and processibility; of composite propellant composition containing about 88 weight percent solids (ammonium perchlorate, aluminum, and Fe2O3 catalyst), a binder of hydroxy-terminated polybutadiene and dioctyladipate cured with a mixture of isophorone diisocyanate and a trifunctional isocyanate. GRA

N85-21397*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF HYDRAZINE AS AN ALTERNATE SOURCE OF ENERGY [O USE DO HIDRAZINE COMO FONTE ALTERNATIVA DE ENERGIA]
Joao A. Carvalho, Jr., Claudio Bressan, and Jorge L. G. Ferreira Aug. 1984 12 p refs Presented at the 3rd Brazilian Congr. on Energy, Rio de Janeiro, Oct. 1984 Sponsored by NASA
(NASA-CR-175535; NAS 1.26:175535; INPE-3294-PRE/609) Avail: NTIS HC A02/MF A01 CSCL 21D

The potentials of using hydrazine as an alternative source of energy was studied. Three chemical reactions are considered: oxidation with air, oxidation with hydrogen peroxide, and thermo-catalytic decomposition. Performance data of gasoline, ethylic alcohol, and propane are compared. An item about the NO(x) emissions by the various investigated reactions is included. Promising results are shown, mainly those regarding the available energy per unit volume of unburned gases (vaporized fuel and oxidizer). E.A.K.

N85-21398# Committee on Science and Technology (U. S. House).
DEVELOPMENTS IN THE PRODUCTION AND USE OF ETHANOL FUELS
Washington GPO 1985 296 p refs Joint hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., and the Subcomm. on Wheat, Soybeans, and Feed Grains of the Comm. on Agr., 98th Congr., 2nd Sess., No. 140, 6 Jul. and 14 Aug. 1984
(GPO-40-678) Avail: Subcommittee on Investigations and Oversight

Ethanol is the only completely environmentally benign octane enhancer currently available. The impact of Federal policies on the production of this fuel is examined. Marketing, the threat posed by subsidized ethanol imports from Brazil, and technologies being developed to improve distillation are discussed as well as the economic growth of areas where ethanol plants are located. The problems of grain farmers are also considered. A.R.H.

N85-21399# Martin Marietta Aerospace, Denver, Colo.
ATMOSPHERIC DISPERSION OF HYPERGOLIC LIQUID ROCKET FUELS, VOLUME 1 Final Report, Jun. 1982 - Dec. 1983
W. R. Haas and S. Prince Tyndall AFB, Fla. Air Force Engineering and Services Center Nov. 1984 31 p
(Contract F42600-81-D-1379)
(AD-A149597; AFESC/ESL-TR-84-18-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 21/9

Titan 2 weapons systems are charged with hypergolic liquid rocket propellants (hydrazine fuel and nitrogen tetroxide oxidizer). These same propellents are used in support of other systems, including the MX missile and the space shuttle. This effort was designed to characterize the interactions of hypergolic liquid rocket propellants and to provide information pertinent to the development of a model to describe the transport and diffusion of airborne combustion products and unreacted vapors from an accident involving these propellants. This report is prepared in two volumes. Volume 1 addresses the reactions between nitrogen tetroxide and hydrazine, including the reaction products and the heat released. This information was used to determine the combustion time and the height of the resulting fireball before it cools and disperses with the air. Volume 2 discusses the chemical and physical interactions of the combustion products with air, and the dispersion of these products in the environment. GRA

N85-21400# Army Construction Engineering Research Lab., Champaign, Ill.

DIESEL FUEL ALTERNATIVES FOR ENGINES IN CIVIL WORKS PRIME MOVERS Interim Report
B. J. Sliwinski and E. Corcoran Sep. 1984 70 p
(AD-A149738; CERL-IR-E-200) Avail: NTIS HC A04/MF A01 CSCL 21/4

This is the first phase of research to determine fuel alternatives for Corps of Engineers medium-speed diesel engines. The literature has been searched to provide a background in current research and to identify the most promising alternatives to petroleum fuel. The criteria assessed were performance-based, with most variables compared to a No. 2 diesel fuel baseline. Results indicate that liquified coal, cetane-improved alcohol, and vegetable oils may be suitable alternatives. However, since much of the data reviewed were based on high-speed engines, additional data on medium-speed engines must be gathered making final recommendations. GRA

N85-21401# SRI International Corp., Menlo Park, Calif.
OXIDATION AND GUM FORMATION IN JET FUELS Interim Report
F. R. Mayo 16 Nov. 1984 7 p
(Contract DAAG29-84-K-0161)
(AD-A149934; ARO-21165.1-EG; IR-1) Avail: NTIS HC A02/MF A01 CSCL 21/4

Chapter 6 in the Russian book by E. T. Denisov and G. I. Kovalev, Oxidation and Stabilization of Jet Fuels, is reviewed. It deals with the effects of many metal and alloy surfaces on gum and deposit formation from a stable jet fuel (T-6) produced by hydrodearomatization. The metals affect oxidations mostly by assisting or retarding the initiation of a subsequent homogeneous oxidation. The effects of the metals and the differences among them are small to moderate. GRA

N85-21402# Los Alamos Scientific Lab., N. Mex.
HIGH-TEMPERATURE-STABLE DETONATORS
Robert H. Dinegar Oct. 1984 7 p ref
(Contract W-7405-eng-36)
(DE85-005188; LA-10172-MS) Avail: NTIS HC A02/MF A01

Current experiments in the area of high-temperature-stable detonators involve using HMX, KP, HNS, and PYX explosives. The test devices employ both hot-wire flying-plate and slapper modes of operation. Hot-wire detonators using HMX as the donor explosive, with HMX, KP, and HNS as the intermediate acceptor material and HNS as the booster pellet, were successfully fired at temperatures as high as 225 C. Very limited success was achieved using PYX explosive in a few experiments. The program of investigation also calls for the development of a high-temperaure-stable hot-wire device functioning in the DDT mode of operation. PYX explosive - a truly high-temperature-stable explosive was initiated to detonation by low-energy slapper foils. DOE

N85-21403# Los Alamos Scientific Lab., N. Mex.
NONPRIMARY-EXPLOSIVE, HOT-WIRE DETONATOR
Robert H. Dinegar Oct. 1984 8 p
(Contract W-7405-eng-36)
(DE85-005195; LA-10173-MS) Avail: NTIS HC A02/MF A01

A nonprimary-explosive, hot-wire detonator, employing the deflagration-to-detonation transition (DDT) process, was developed. Pentaerythritol tetranitrate (PETN) is the explosive used. The assembly is nominally a 1-X/1-W/1-(UC OMEGA) system. The DDT process was examined over a range of PETN specific surface values (3000 to 14,500 cm(2)/g) and pressing densities (1.0 to 1.4 g/cm(3)). The reaction is sensitive to the degree of subdivision and the compactness of the explosive in which the transition takes place. It apparently happens better with PETN of small specific surface loaded at low density. Consistent transitions from burning to detonation occur in PETN pressings 9 mm or more in length, with diameters of about 2 mm. Increasing the charge diameter by a factor of 2 appears to allow a shortening of the required charge length by several millimeters. DOE

N85-21420# Joint Publications Research Service, Arlington, Va.
WAVEFORM CONTROL AND APPLICATION OF DETONATION WAVE IN EXPLOSIVES
Chen Weibo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 74-83 refs Transl. into ENGLISH from Lixue Yu Shijian (Beijing), no. 5, 1984 p 7-12 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-21404* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGENTICALLY ACTUATED COMPRESSOR Patent
Jack Evans and Philip A. Studer, inventors (to NASA) Issued 19 Feb. 1985 9 p Filed 28 Jan. 1983 Supersedes N83-20153 (21 - 10, p 1526)
(NASA-Case-GSC-12799-1; NAS 1.71:GSC-12799-1; US-Patent-4,500,265; US-Patent-Appl-SN-461724; US-Patent-Class-417-417; US-Patent-Class-417-488; US-Patent-Class-310-22; US-Patent-Class-31-35; US-Patent-Class-62-6; US-Patent-Class-92-98R) Avail: US Patent and Trademark Office CSCL 13H

A vibration free fluid compressor particularly adapted for Stirling cycle cryogenic refrigeration apparatus comprises a pair of identical opposing ferromagnetic pistons located in a housing and between a gas spring including a sealed volume of a working fluid such as gas under pressure. The gas compresses and expands in accordance with movement of the pistons to generate a compression wave which can be vented to other apparatus, for example, a displacer unit in a Stirling cycle engine. The pistons are urged outwardly due to the pressure of the gas; however, a fixed electromagnetic coil assembly located in the housing adjacent the pistons, is periodically energized to produce a magnetic field which interlinks the pistons in such a fashion that the pistons are mutually attracted to one another. The mass of the pistons, in conjunction with the compressed gas between them, form a naturally resonant system which, when the pistons are electromagnetically energized, produces an oscillating compression wave in the entrapped fluid medium.
Official Gazette of the U.S. Patent and Trademark Office

N85-21405 Department of the Air Force, Washington, D.C.
METHOD OF MULTIVARIANT INTRACLASS PATTERN RECOGNITION Patent
C. F. Hester and D. P. Casasent, inventors (to Air Force) Issued 11 Dec. 1984 7 p Supersedes AD-D008946
(AD-D011546; US-Patent-4,487,476; US-Patent-Appl-SN-258500; US-Patent-Class-350-162.13) Avail: US Patent and Trademark Office CSCL 06/4

A method of recognizing different perspective views or images (i.e., multivariant views) of the same object (i.e., intraclass patterns) is disclosed. Each intraclass pattern, or different representation of the same object, is described as an orthonormal basis function expansion, and a single averaged matched spatial filter is produced from a weighted linear combination of these functions. The method eliminates the multiple matched spatial filters, and the extensive postprocessing of the matrix output from a multichannel correlator, which are used in the prior art. GRA

N85-21406*# National Aeronautics and Space Administration, Washington, D. C.
SLIP CASTING AND NITRIDATION OF SILICON POWDER
Yachiho Seiko Mar. 1985 9 p refs Transl. into ENGLISH from Osaka Kogyo Gijutsu Shikensko Kiho (Japan), v. 33, no. 4, 1982 p 424-427
(Contract NASw-4004)
(NASA-TM-77809; NAS 1.15:77809) Avail: NTIS HC A02/MF A01 CSCL 13H

Powdered Silicon was slip-cast with a CaSO4 x 0.5H2O mold

and nitrided in a N atm. containing 0 or 5 vol. % H at 1000 to 1420 deg. To remove the castings, the modeling faces were coated successively with an aq. salt soap and powdered cellulose containing Na alginate, and thus prevented the sticking problem.
Author

N85-21407*# National Aeronautics and Space Administration. Pasadena Office, Calif.
IMPROVED SILICON GRINDING METHOD AND APPARATUS Patent Application
Earl R. Collins, Jr., inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 29 Nov. 1984 9 p Sponsored by NASA (NASA-Case-NPO-16336-1-CU; NAS 1.71:NPO-16336-1-CU; US-Patent-Appl-SN-676163) Avail: NTIS HC A02/MF A01 CSCL 13H

Opposing streams of silicon particles collide to form a collision product, which is repeatedly graded, refined by a series of jet mills and recycled to provide an output containing an improved yield of useful particles.
NASA

N85-21408# Albany International Corp., Dedham, Mass.
FINGER MATERIALS FOR AIR CUSHION VEHICLES. VOLUME 2: BASE FABRICS FOR FINGER MATERIALS Technical Report, Oct. 1977 - Aug. 1982
M. M. Schoppee, J. Skelton, M. M. Toney, and W. Klemens Dec. 1984 94 p
(Contract N00600-77-C-1291; F61-541)
(AD-A149701; DTNSRDC-85/004) Avail: NTIS HC A05/MF A01 CSCL 11/5

Since the short lifetimes of seal/skirt systems on surface effect vehicles (SEV's) severely limit the long-term serviceability on such craft, a systematic study was undertaken to evaluate the effects of fabric structure on the performance of rubber/fabric skirt materials under conditions of high speed, high-curvature flexing. A series of nylon fabrics was designed and manufactured in which the fiber denier, yarn denier, yarn twist, yarn crimp, weave pattern and float length were varied, but in which the tensile strength was kept constant throughout. Each one of the fabrics was rubber-coated using the same natural rubber/polybutadiene blend and the same coating technique. A flex-testing apparatus was designed and built for flexing the rubber/fabric composite materials in air at an average radius of curvature of 0.28 in. at a cycling frequency of 15 Hz. The lifetimes in flex of the experimental series of fabrics, as indicated by the appearance of flex cracks in the rubber layer, ranged from a low of 140,000 cycles to a high of 21.7 million cycles, a range of over two orders of magnitude. Factorial analysis of the test results showed that lower yarn denier, lower yarn crimp, and shorter float length (plain weave) in the fabric substrate offer significant advantages in the ability of the fabric to withstand flexing. Design of three broad fabrics for full-scale skirt trials on the SRN4 craft is described.
GRA

N85-21409# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
STEEL CASTINGS BY THE ELECTROSLAG CASTING TECHNIQUE
V. K. Sikka and A. Mitchell (British Columbia Univ., Vancouver) Oct. 1984 28 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003812; ORNL/TM-9115) Avail: NTIS HC A03/MF A01

Electroslag casting facilities in Canada and the United States were reviewed. Several value body castings of 2 1/4 Cr-1 Mo, 9 Cr-1 Mo, and 18% Cr-8% Ni (Mo) steels were made at the University of British Columbia facility. These castings were examined for surface finish, chemical segregation, and macrostructure in the as-cast condition and after various heat treatments. Castings were subjected to tensile, charpy impact, and creep testing. Results of these tests were compared with similar data on wrought material and where applicable, with data on sand castings.
DOE

N85-21410# Rockwell International Corp., Golden, Colo.
SPEED AND ACCURACY IN AUTOMATED MANUFACTURE
Marvin W. Burnham 1984 13 p refs
(Contract DE-AC04-76DP-03533)
(DE85-003913; RFP-3628) Avail: NTIS HC A02/MF A01

It is illustrated, with several real manufacturing examples, that speed and accuracy are not necessarily adversary concepts. Rather, in many cases, increased speed results from an improvement in the accuracy of components produced. Thus, the effort to improve accuracy is frequently cost effective and results in an increase in productivity. However, in those cases in which speed and accuracy both improve, new methodology or an over-all view is needed before the improvement is apparent. Some areas used as examples are: accuracy in rolls used in crush dressed form grinding, inspection and assembly time savings, and deep hole drilling.
DOE

N85-21411# Technische Univ., Clausthal-Zellerfeld (West Germany). Inst. fuer Ernergieverfahrenstechnik.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF DUST LOADED FLOW FIELDS IN INDUSTRIAL HALLS Final Report, Jun. 1982
Reinhard Wagner, Rudolf Jeschar, and Reinhard Scholz Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 141 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-84-044; ISSN-0171-7618) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 30

Dust flow field simulations are presented. Dimensionless characteristic factors governing the flow field were derived for the drafting of scaled down models of an industrial hall. It is shown that experiments are only practicable if the free aerodynamic lift over a heat source is substituted by forced convection. A steel foundry flow field and the resulting flow in the model were compared. Good applicability is stated. Experiments give information on location and dimensioning of induction and extraction systems in a steel foundry.
Author (ESA)

N85-21412# Mississippi State Highway Dept., Jackson.
EVALUATION OF EPOXO 300-C NONSKID COATING FOR USE ON BRIDGE DECKS Final Report
Sidney Q. Kidd Jan. 1984 42 p Sponsored in part by FHA
(PB85-108843; SS-67-7) Avail: NTIS HC A03/MF A01 CSCL 13B

There is a problem of polishing steel grid bridge decks. The I-10 bridge over the East Pascagoula River is of particular concern because of the volume, speed of traffic, length of span, and the rapid decrease in skid numbers. In addition, the grid causes lateral movement which is critical with motorcycles. The purpose of the study was to find a better way to improve skid resistance on steel grid bridge decks. It appears from the tests that Epoxo will provide a good long-life skid resistant surface on concrete and also steel plate. On the steel grid the wear is much heavier because of the small contact area between the tire and the grid.
GRA

N85-21413# Sunpower, Inc., Athens, Ohio.
GAS-FIRED DUPLEX FREE-PISTON STIRLING REFRIGERATOR Final Report, Nov. 1982 - Mar. 1984
L. Urieli Mar. 1984 56 p refs Sponsored by Gas Research Inst.
Avail: NTIS HC A04/MF A01 CSCL 13A

The duplex free-piston Stirling refrigerator is a potentially high efficiency, high reliability device which is ideally suited to the home appliance field, in particular as a gas-fired refrigerator. It has significant advantages over other equivalent devices including freedom from halogenated hydrocarbons, extremely low temperatures available at a high efficiency, integrated water heating, and simple burner system control. The design and development of a portable working demonstration gas-fired duplex Stirling refrigeration unit is described. A unique combination of computer aided development and experimental development was used, enabling a continued interaction between the theoretical analysis and practical testing and evaluation. A universal test rig was developed

in order to separately test and evaluate major subunits, enabling a smooth system integration phase. GRA

N85-21414*# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Engineering and Technical Systems.
COMPUTER INTEGRATION OF ENGINEERING DESIGN AND PRODUCTION: A NATIONAL OPPORTUNITY Final Report
Oct. 1984 73 p
(Contract NASw-3811)
(NASA-CR-175483; NAS 1.26:175483; PB85-128429) Avail: NTIS HC A04/MF A01 CSCL 13H

The National Aeronautics and Space Administration (NASA), as a purchaser of a variety of manufactured products, including complex space vehicles and systems, clearly has a stake in the advantages of computer-integrated manufacturing (CIM). Two major NASA objectives are to launch a Manned Space Station by 1992 with a budget of $8 billion, and to be a leader in the development and application of productivity-enhancing technology. At the request of NASA, a National Research Council committee visited five companies that have been leaders in using CIM. Based on these case studies, technical, organizational, and financial issues that influence computer integration are described, guidelines for its implementation in industry are offered, and the use of CIM to manage the space station program is recommended. GRA

N85-21415# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
STRESS-RELIEVING INTERLAYERS FOR BITUMINOUS RESURFACINGS Interim Research Report
Douglas A. Frederick Apr. 1984 40 p
(Contract HPR-FCP-45D2-664; Proj. 160-1)
(PB85-136885; FHWA/NY/RR-84/113) Avail: NTIS HC A03/MF A01 CSCL 11C

The effectiveness of stress relieving interlayers (SRIs) in reducing reflective cracking in bituminous overlays on flexible pavements was investigated. SRI test sections were installed in 1980 and 1981 at five locations comprised of both 1 and 2-1/2 in overlays. Before construction, cracks were mapped in detail and deflection was measured to determine causes of cracking. SRIs tested included full width nonwoven and woven fabrics, rubberized asphalt surface treatments, reinforced rubberized asphalt strips, and composite fiberglass-asphalt binder systems. Construction of these test installations is summarized. Results of annual surveys have yet to prove conclusively the value of using these materials or their comparative effectiveness. GRA

N85-21416# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
27 Mar. 1985 143 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-008) Avail: NTIS HC A07/MF A01

Strategies for developing policies for the economic, social, and technical development of China are discussed as well as advances in photoacoustics and computational fluid dynamics. Detonation wave control is discussed. For individual titles, see N85-21417 through N85-21426.

N85-21417# Joint Publications Research Service, Arlington, Va.
DISTANCE-INERTIAL GUIDANCE OF LAUNCH VEHICLE DESCRIBED c15
Guo Xiaokuan, Yue Peiyu, and An Weilian *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 31-36 refs Transl. into ENGLISH from Zidonghua Xuebao (Beijing), no. 4, Oct. 1984 p 361-364 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

The basic principle of a distance-inertial guidance system is summarized, the affine coordinate inertial coordinate system is defined, and coordinate transformation is discussed. Simulation and flight test results show that during the boost phase, the accuracy of a distance-inertial guidance system is considerably higher than a pure inertial guidance system with the same inertial components. Since the system requires only simple ranging equipment near the launch site and is only to be used during the boost phase of the launch vehicle, launch preparation is easy and the likelihood of outside interference is very small. Since the pure inertial guidance section and the distance-inertial navigation section are independent of each other, the correction given by the composite navigation is applied after the identification calculation. Introduction of the distance information does not affect the autonomy or the reliability of the inertial guidance system. A.R.H.

N85-21418# Joint Publications Research Service, Arlington, Va.
SYSTEMS RESEARCH ON CHINA IN YEAR 2000 c81
Wang Huijiang and Li Boxi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 37-50 Transl. into ENGLISH from Xitong Gongcheng Lilun Yu Shijian (Beijing), no. 2, 1984 p 15-23 (For primary document see N85-21416 12-31)
Avail: NTIS HC A02/MF A01

The ideology for the research in and drafting of development strategy in China is reviewed and the application of generalized systems theory for establishing policies for achieving projected goals in the social, economic, and science and technology areas is examined. Particular emphasis is given to the organization in systems engineering including, input, structural composition, management, technical composition, ideological composition, coordination level, objectives and requirements, environment, and output. The research structure envisioned for China by the year 2000 includes departmental and regional research organizations; topic, itemized, and summary reports; and interdependent, interdisciplinary academic societies. A.R.H.

N85-21419# Joint Publications Research Service, Arlington, Va.
POTENTIAL AT ATOMIC BOUNDARIES IN THE TF (OR TFD) MODEL AND EQUATIONS OF STATES c72
Cheng Kaijia, Fan Qike, and Gao Zhanpeng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 51-73 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 33, no. 2, Feb. 1984 p 176-192 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

While the Thomas method of applying Fermi statistics to treat atomic problems is not so accurate as the Hartree-Fock self-consistent method, it is simple to use and provides a clear picture of physical insight. The theory of statistics is applied to calculate the equations of state of matter, the calculated results are in good agreement with observed values for elements with high atomic numbers or in the high pressure range; but in the low pressure range, they are higher than the observed values by an order of magnitude. Dirac's correction to the TF theory to account for the exchange energy is called the TFD model. While the TFD method yields lower pressure, the calculated results are still much higher than the measured values in the low pressure range. It is pointed out that in calculating the pressure at atomic boundaries using the virial theorem, the potential at the boundary should not vanish. The cold-pressure equations of states are presented: U, Pb, Au, Ag, Cu, Fe, K, Al, Na and Li. A.R.H.

N85-21420# Joint Publications Research Service, Arlington, Va.
WAVEFORM CONTROL AND APPLICATION OF DETONATION WAVE IN EXPLOSIVES c28
Chen Weibo *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 74-83 refs Transl. into ENGLISH from Lixue Yu Shijian (Beijing), no. 5, 1984 p 7-12 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

The principles of detonation wave control by electric wire and by light are summarized and the benefits of single point detonation are examined. Three types of linear waves are discussed as well as the mouse trap, composite charge, and flying disk plane wave lenses. The formation of an approximate and an ideal cylindrically contracting wave is also considered. A.R.H.

N85-21421# Joint Publications Research Service, Arlington, Va.
PHOTOACOUSTIC EFFECT AND ITS APPLICATIONS Abstract

Only **c71**
Moan Wei and Menglu Qian *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 90 Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 3, no. 4, Oct. 1984 p 5-11 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

Photoacoustic detection characteristics, as well as the principle and applications of the photoacoustic effect in gases and solids are introduced. Figures show a gas photoacoustic detection system; a photoacoustic spectrum of benzene and Lamb's depression for methyl alcohol as displayed by a CO2 laser; a correlation curve of pure CH4; resonance curves for (C-12)O2 and (C-13)O2; a photoacoustic resonator of a microphone detection system; a transducer-specimen assembly of detection system of a piezoelectric transducer; a weak-absorption set-up for photoacoustic detection of solids; an optico-acoustical spectrum for the epidermis of guinea-pigs; and determination of photoelectric quantum efficiency Q of thin dye films. Tables give the P (tau) values of the oscillatory relaxation of CH4 determined by several methods, and a comparison of results of weak absorption determination.
A.R.H.

N85-21422# Joint Publications Research Service, Arlington, Va.
COMPENSATION OF SKEW PASSBAND OF A SAW FILTER USING PREDISTORTION Abstract Only **c33**
Guanglun Huang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 91 Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 3, no. 4, Oct. 1984 p 27-30 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

A predistortion design by using a variable-track transducer with the interval of the same number of cycles is presented to compensate for the skew passband of a SAW filter. Three types of filters designed and manufactured with two types of substrates are introduced. Experimental results before and after compensation demonstrate that this is a simple and effective method of compensation design. Data on three types of filters made of the substrate materials, a transducer side lobe, and characteristics before and after compensation are tabulated. The expected and actual rectangular frequency responses; simulation of the distortion response and mathematical description of the compensation design; and the design structure of devices used in experiments are illustrated. Photos show: the passband characteristics and passband response of two filters before and after compensation, overall frequency response of another filter, and forked transducer.
A.R.H.

N85-21423# Joint Publications Research Service, Arlington, Va.
A CALCULATION OF SLENDER DELTA WING WITH LEADING-EDGE SEPARATION BY QUASI-VORTEX-LATTICE METHOD Abstract Only **c02**
Shanwen Xiong *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 92 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 21-26 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

The quasi-vortex-lattice method (QVLM) which was used to calculate the thin wing with separation was extended to calculate the slender delta wing with leading-edge separation. The advantage of this method is that the leading-edge boundary condition can be satisfied exactly. It can be used to predict aerodynamic characteristics of wings having partial leading-edge separation. A calculation was for a slender delta wing with complete leading-edge separation and the results are compared with those of the experimental data. The comparison shows that QVLM can give satisfactory or reasonable results.
Author

N85-21424# Joint Publications Research Service, Arlington, Va.
CALCULATION OF THE FLOW AROUND THICK WINGS WITH SEPARATION VORTICES Abstract Only **c02**
Peiye Zhu *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 93 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 27-33 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

A panel method predicting the nonlinear aerodynamic loads on thick wings with separation vortices is developed. The model used is simple and visual. The method can be used for arbitrary planform wings with different profiles. A planar quadrilateral panel and a panel that consists of a parallelogram and four triangles are used. In order to obtain a high degree of accuracy, the wing is represented by piecewise continuous quadratic doublet sheet distributions. The computed aerodynamic loads on the rectangular and sweepback wings agree well with experimental tests and other theories.
Author

N85-21425# Joint Publications Research Service, Arlington, Va.
THE SPLIT-COEFFICIENT MATRIX METHOD FOR SUPERSONIC THREE DIMENSIONAL FLOW Abstract Only **c02**
Lumin Zhang and Xiaonan Shan *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 94 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 4, 1984 p 41-47 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

The split coefficient matrix (SCM) finite difference method for solving inviscid steady supersonic flow over a nonsymmetrical body is presented. This method is based on the mathematical theory of characteristics. In the SCM approach, these coefficients are split according to the sign of the characteristic slopes, and the split coefficients are then multiplied by the appropriate unilateral differences. Forward difference are associated with negative characteristic slopes, while backward differences are associated with positive slope values. The numerical example of the blunt sphere cones is worked out and compared with the results of an earlier method cited to demonstrate the accuracy of SCM in rare mesh.
Author

N85-21426# Joint Publications Research Service, Arlington, Va.
AN EXPERIMENTAL INVESTIGATION OF FLAP TURBULENT HEAT TRANSFER AND PRESSURE CHARACTERISTICS IN HYPERSONIC FLOW Abstract Only **c02**
Ruifeng Gao *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 95 Transl. into ENGLISH from Kongqidonglixue Xueabo (China), no. 4, 1984 p 56-60 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

Experimental results are given of flap heat transfer and pressure characteristics on a blunt cone in a shock tunnel. Effects of flap deflection angle, angle of attack, Mach number and unit Reynolds number are discussed. Results show that the flap deflection angle and Mach number are decisive factors which considerably affect the flap heating, pressure characteristics and control effectiveness. A correlation between peak heating and peak pressure is given as well as an empirical formula for estimating peak heating.
Author

N85-21567# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING COOLDOWN PROCESS IN CRYOSTAT OF CRYOGENIC ELECTRIC MACHINE Abstract Only
Andrey Serafimovich Veselovskiy, Stanislav Sergeyevich Skvortsov, and Aleksandr Ivanovich Plis *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 50 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 50-53 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-21427* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

TELEVISION CAMERA VIDEO LEVEL CONTROL SYSTEM Patent
Marvin Kravitz (RCA, Princeton, N.J.), Larry A. Freedman (RCA, Princeton, N.J.), Elmer H. Fredd (RCA, Princeton, N.J.), and Dan E. Denef, inventors (to NASA) (RCA, Princeton, N.J.) Issued 22 Jan. 1985 8 p Filed 9 Apr. 1982 Supersedes N82-27121 (20 - 17, p 2474) Sponsored by NASA
(NASA-Case-MSC-18578-1; NAS 1.71:MSC-18578-1; US-Patent-4,495,520; US-Patent-Appl-SN-367132; US-Patent-Class-358-219; US-Patent-Class-358-217; US-Patent-Class-358-174; US-Patent-Class-358-161) Avail: US Patent and Trademark Office CSCL 17B

A video level control system is provided which generates a normalized video signal for a camera processing circuit. The video level control system includes a lens iris which provides a controlled light signal to a camera tube. The camera tube converts the light signal provided by the lens iris into electrical signals. A feedback circuit in response to the electrical signals generated by the camera tube, provides feedback signals to the lens iris and the camera tube. This assures that a normalized video signal is provided in a first illumination range. An automatic gain control loop, which is also responsive to the electrical signals generated by the camera tube 4, operates in tandem with the feedback circuit. This assures that the normalized video signal is maintained in a second illumination range.
Official Gazette of the U.S. Patent and Trademark Office

N85-21428* National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTICOMPUTER COMMUNICATION SYSTEM Patent
Anil K. Agrawal (JPL, California Inst. of Tech., Pasadena), Philip G. Mullen (JPL, California Inst. of Tech., Pasadena), and Vivatvong V. Vadakan, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 8 Jan. 1985 17 p Filed 3 Apr. 1981 Supersedes N83-20634 (21 - 10, p 1596) Sponsored by NASA
(NASA-Case-NPO-15433-1; NAS 1.71:NPO-15433-1; US-Patent-4,493,021; US-Patent-Appl-SN-250585; US-Patent-Class-364-200) Avail: US Patent and Trademark Office CSCL 17B

A local area network is provided for a plurality of autonomous computers which operate at different rates and under different protocols coupled by network bus adapters to a global bus. A host computer (HC) divides a message file to be transmitted into blocks, each with a header that includes a data type identifier and a trailer. The associated network bus adapter (NBA) then divides the data into packets, each with a header to which a transport header and trailer is added with frame type code which specifies one of three modes of addressing in the transmission of data, namely a physical address mode for computer to computer transmission using two bytes for source and destination addresses, a logical address mode and a data type mode. In the logical address mode, one of the two addressing bytes contains a logical channel number (LCN) established between the transmitting and one or more receiving computers. In the data type mode, one of the addressing bytes contains a code identifying the type of data.
Official Gazette of the U.S. Patent and Trademark Office

N85-21429 Communications Research Centre, Ottawa (Ontario). Information and Technology Information Branch.
ESTIMATION OF THE IMPULSE RESPONSE OF TELEVISION CHANNELS FROM DIGITIZED WAVEFORMS
Andre Vincent and Mario Bruneau Feb. 1985 59 p refs
(CRC-1376) Avail: Issuing Activity

A technique to characterize television channels without disrupting the normal video program is presented. TELETEXT data lines transmitted during the vertical blanking interval are digitized. The least squares analysis is applied on the sampled data to estimate the channel impulse response, from which the amplitude and phase characteristics are computed. The television and teletext signals are reviewed. Then, the theory and implementation of least squares analysis techniques are presented. Also, the signal processing leading to TV channel transfer function evaluation is described. Author

N85-21430 British Broadcasting Corp., Kingswood (England). Engineering Div.
AN ELECTRONICALLY-STEERABLE ACTIVE RECEIVING ARRAY FOR h.f.
A. P. Robinson Feb. 1985 22 p refs
(BBC-RD-1985/2) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

The array described offers advantages over the directional aerials commonly used for monitoring at h.f. It is compact and can be steered electronically in any direction. A steerable null may be placed in the radiation pattern. Active elements are used so that the effects of mutual coupling are negligible. The array comprises eight short, vertical monopoles in a line, the outputs of which are passed through variable delay lines, and summed. The system is highly linear and has a large dynamic range. The delay lines comprise nine binary steps and are controlled by a microprocessor to give the desired patterns in response to the control settings. The array proved useful addition to the aerial systems at the British Broadcasting Corporation monitoring station. R.J.F.

N85-21431 British Broadcasting Corp., Kingswood (England). Engineering Div.
L.F. RADIO-DATA: SPECIFICATION OF BBC PHASE-MODULATED TRANSMISSIONS ON LONG-WAVE
D. T. Wright Dec. 1984 14 p refs
(BBC-RD-1984/19) Avail: BBC, Kingswood Warren, Tadsworth Surrey, England

The British Broadcasting Corporation long-wave a.m. transmitter network carries a low bit-rate data signal, in addition to the normal program signal modulation. The data signal is conveyed by phase-modulation of the carrier, the signal parameters being chosen so that there is no disturbance to reception on existing domestic receivers. The data signal is described. Details of both the data signal message structure and the modulation parameters are given. R.J.F.

N85-21432 British Broadcasting Corp., Kingswood (England). Engineering Div.
ACOUSTIC SCALING: A RE-EVALUATION OF THE ACOUSTIC MODEL OF MANCHESTER STUDIO 7
R. Walker Dec. 1984 24 p refs
(BBC-RD-1984/18) Avail: BBC; Kingswood Warren, Tadsworth, Surrey, England

The reasons for the reconstruction and re-evaluation of the acoustic scale mode of a large music studio are discussed. The design and construction of the model using mechanical and structural considerations rather than purely acoustic absorption criteria is described and the results obtained are given. The results confirm that structural elements within the studio gave rise to unexpected and unwanted low-frequency acoustic absorption. The results also show that at least for the relatively well understood mechanisms of sound energy absorption physical modelling of the structural and internal components gives an acoustically accurate scale model, within the usual tolerances of acoustic design. The poor reliability of measurements of acoustic absorption coefficients, is well illustrated. The conclusion is reached that such acoustic scale modelling is a valid and, for large scale projects, financially justifiable technique for predicting fundamental acoustic effects. It is not appropriate for the prediction of fine details because such small details are unlikely to be reproduced exactly at a different size without extensive measurements of the material's performance at both scales. M.G.

N85-21433 Department of the Air Force, Washington, D.C.
RADAR CALIBRATION USING DIRECT MEASUREMENT EQUIPMENT AND OBLIQUE PHOTOMETRY Patent
D. I. Zulch and R. H. Brock, Jr., inventors (to Air Force) Issued 18 Dec. 1984 6 p Supersedes AD-D010093
(AD-D011530; US-Patent-4,489,322; US-Patent-Appl-SN-461427;

US-Patent-Class-343-17.7) Avail: US Patent and Trademark Office CSCL 17/9

A radar calibration apparatus for the metric measurement of ground position; by airborne photogrammetry using real time high precision imagery, the transformation of those measurements from camera coordinates to antenna coordinates, the conversion of transformed coordinates to direction cosines of a measured ground position, comparison to radar derived direction, and the calculation and automatic correction of bias errors in direction; of the radar measurement. GRA

N85-21434 Department of the Air Force, Washington, D.C.
MULTIPLE LOOP SIDELOBE CANCELLER Patent
R. J. Masak, inventor (to Air Force) Issued 22 Jan. 1985 15 p Supersedes AD-D009412
(AD-D011533; US-Patent-4,495,502; US-Patent-Appl-SN-343042; US-Patent-Class-343-380) Avail: US Patent and Trademark Office CSCL 17/9

A sidelobe canceller using only a widely spaced auxiliary array can lose performance for multiple jammers located at angles corresponding to the grating lobe structure. The degradation is independent of the number of control loops used. A closely spaced auxiliary array cannot resolve and process closely spaced jammers but is less susceptible to grating lobe occurrences. Its performance can degrade for closely spaced jammers while the widely spaced array has the resolution capability required. A dual array has the resolution capability required. A dual array approach comprised of both widely and closely spaced subarrays was simulated and tested. Each subarray automatically compensated for the deficiencies of the other. The computer simulations predicted the precise nature and locations of these geometrical conditions when the system was tested. Auxiliary channel preprocessing can successfully be used with the dual array approach to simultaneously minimize the differential level problem for multiple jammers. Without preprocessing of the auxiliary array, little, if any cancellation may be achieved against weaker jammers. GRA

N85-21435 Department of the Air Force, Washington, D.C.
LOW SIDELOBE PHASED ARRAY ANTENNA SYSTEM Patent
A. E. Blume, inventor (to Air Force) Issued 18 Dec. 1984 4 p Supersedes AD-D010044
(AD-D011558; US-Patent-4,489,324; US-Patent-Appl-SN-445639; US-Patent-Class-343-372) Avail: US Patent and Trademark Office CSCL 17/9

This patent discloses that in a pulse radar system, wide angle sidelobes are reduced considerably in a phased array antenna by advancing each digital phase shifter by one bit just before each radar pulse is transmitted. This advice maintains the linear phase slope of antenna elements as the difference in phase between adjacent elements is uniform, thereby having little effect on the antenna's main beam. However, the radar return signals from the sidelobes are reduced in comparison to the main beam return due to the radar receiver's integration process. GRA

N85-21436 Department of the Air Force, Washington, D.C.
METHOD AND MEANS FOR PROVIDING FREQUENCY AGILE OPERATION OF MTI (MOVING TARGET INDICATOR) RADAR Patent
D. L. Creed, inventor (to Air Force) Issued 22 Jan. 1985 5 p
(AD-D011561; US-Patent-4,495,501; US-Patent-Appl-SN-373084; US-Patent-Class-343-7.7) Avail: US Patent and Trademark Office CSCL 17/9

The obtaining of simultaneous pulse-to-pulse transmitter carrier frequency agility and compatible moving target indicator (MTI) operation in conventional surveillance radars is achieved by the use of pairs of frequencies with a controlled relationship between the frequencies of each pair. A set of four pulses with different frequencies is sequentially transmitted and form two pairs of pulses. The difference between the frequencies of one pair of pulses is made equal to the difference between the frequencies of the second pair of pulses. MTI operation is obtained by differencing the pairs. Pulses having any three frequencies may be selected in any sequence before a constraint is imposed. The frequency of the fourth pulse is then determined by the frequencies of the first three pulses. Author (GRA)

N85-21437 Department of the Air Force, Washington, D.C.
DETECTION OF ANGULAR MODULATED ELECTROMAGNETIC SIGNALS Patent
P. VanEtten, inventor (to Air Force) Issued 25 Dec. 1984 5 p Supersedes AD-D010037
(AD-D011563; US-Patent-4,490,829; US-Patent-Appl-SN-445646; US-Patent-Class-375-1) Avail: US Patent and Trademark Office CSCL 17/2

A signal processing circuit which operates on a spread spectrum received signal to compress it into a waveform of sufficient amplitude to allow detection by conventional means. The received signal is filtered and split onto two paths, each path being mixed with an upper or lower single sideband created by an oscillator and modulator combination. The output of each mixer is filtered and mixed together in a third mixer, the resultant output of which is fed through a narrow bandpass filter to a conventional signal detector. Author (GRA)

N85-21438*# Illinois Univ., Urbana. Electromagnetics Lab.
NUMERICAL METHODS FOR ANALYZING ELECTROMAGNETIC SCATTERING Semiannual Report, 25 Sep. 1984 - 24 Mar. 1985
S. W. Lee, Y. T. Lo, S. L. Chuang, and C. S. Lee 24 Mar. 1985 66 p refs
(Grant NAG3-475)
(NASA-CR-175507; NAS 1.26:175507) Avail: NTIS HC A04/MF A01 CSCL 20N

Numerical methods to analyze electromagnetic scattering are presented. The dispersions and attenuations of the normal modes in a circular waveguide coated with lossy material were completely analyzed. The radar cross section (RCS) from a circular waveguide coated with lossy material was calculated. The following is observed: (1) the interior irradiation contributes to the RCS much more than does the rim diffraction; (2) at low frequency, the RCS from the circular waveguide terminated by a perfect electric conductor (PEC) can be reduced more than 13 dB down with a coating thickness less than 1% of the radius using the best lossy material available in a 6 radius-long cylinder; (3) at high frequency, a modal separation between the highly attenuated and the lowly attenuated modes is evident if the coating material is too lossy, however, a large RCS reduction can be achieved for a small incident angle with a thin layer of coating. It is found that the waveguide coated with a lossy magnetic material can be used as a substitute for a corrugated waveguide to produce a circularly polarized radiation yield. E.A.K.

N85-21439*# General Electric Co., Philadelphia, Pa. Space Systems Div.
THE 60 GHz ANTENNA SYSTEM ANALYSES FOR INTERSATELLITE LINKS, PHASE A Final Report
Jun. 1984 135 p
(Contract NAS5-27791)
(NASA-CR-175285; NAS 1.26:175285; Rept-84SDS4255) Avail: NTIS HC A07/MF A01 CSCL 20N

A tradeoff study for 60 GHz antenna systems applicable to an advanced Tracking and Data Acquisition System is also discussed. A conceptual design of a preferred antenna system is also discussed. The tradeoff results for four types of antenna systems are presented: (1) Reflector/fixed feed, (2) Mechanical scan, (3) Electronic scan; and (4) Hybrid mechanical/electronic scan. The 12 candidate antennas were assessed on the basis of a preliminary design and a performance analysis then were scored against 15 weighted parameters. This process resulted in the ranking of the 12 candidates for the two applications, namely, for the geostationary TDAS only with a narrow field of view and for low orbit user satellites with a wide field of view. B.W.

N85-21440# Los Alamos Scientific Lab., N. Mex.
AEROSOL MULTIPLE-SCANNING CODE, ASCAT
A. Zardecki and S. A. W. Gerstl Jun. 1984 54 p refs Sponsored

in part by the Army
(Contract W-7405-eng-36)
(LA-10046-MS) Avail: NTIS HC A04/MF A01

The well-known theory of Dolin and Fante describing multiple scattering is applied to analyze the intensity and power received by a detector with a variable field of view. The multiple scattering problem for a finite slab geometry including the cases of converging and diverging beams is solved using the ASCAT code. The backscattering from randomly distributed scatterers is included in the theory by solving, to the first approximation, a coupled system of equations for the forward and backward specific intensities. When supplemented with least squares fitting subroutines allowing one to determine the width of the forward and backward peaks of the scattering phase function, the ASCAT computer code yields rapidly the information about the on-axis multiple scattering in transmissometer and lidar configurations. B.W.

N85-21441*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DOUBLE REFERENCE PULSED PHASE LOCKED LOOP (DRP-2L-2) Patent Application
Joseph S. Heyman, inventor (to NASA) Filed 7 Mar. 1985 10 p
(NASA-Case-LAR-13310-1; NAS 1.71:LAR-13310-1;
US-Patent-Appl-SN-709257) Avail: NTIS HC A02/MF A01 CSCL 20N

A double reference pulse phase locked loop is described which measures the phase shift between tone burst signals initially derived from the same periodic signal source (voltage controlled oscillator) and delayed by different amounts because of two different paths. A first path is from the transducer to the surface of a sample and back, and a second path is from the transducer to the opposite surface and back. A first pulse phase locked loop including a phase detector and a phase shifter forces the tone burst signals delayed by the second path in phase quadrature with the periodic signal source. A second pulse phase locked loop including a second phase detector forces the tone burst signals delayed by the first path into phase quadrature with the phase shifted periodic signal source. NASA

N85-21442 British Broadcasting Corp., Kingswood (England). Engineering Div.
TELEVISION ANIMATION STORE: DIGITAL CHROMA, KEY AND MIXER UNITS
V. G. Devereux Dec. 1984 16 p refs
(BBC-RD-1984/16) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

The digital chroma-key (also called color separation overlay) unit described is incorporated in a digital video storage system which is used in the preparation of animated picture sequences obtained from an electronic rostrum camera. The circuitry operates on digital YUV video signals and can generate key signals from any selected color in the foreground picture; these key signals are then used to replace the areas of the chosen color in the foreground picture by a background picture using linear, additive key techniques. In addition, key signals can be obtained from the foreground's luminance component. The technical details and ergonomic control of the unit are described. Problems associated with digital processing are discussed. Author

N85-21443 British Broadcasting Corp., Kingswood (England). Engineering Div.
THE 20:16 BLOCK CODE FOR DIGITAL RECORDING AND TRANSMISSION CHANNELS
M. A. Parker Jan. 1985 12 p refs
(BBC-RD-1985/1) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

A new channel code which offers several advantages is presented. These advantages include a higher frequency of data transitions in the serial coded data, a greater ability to detect errors, and the inclusion of rugged framing information. It was devised for use with magnetic tape recording but is equally applicable to other forms of recording, and has been used for optical fiber transmission. Author

N85-21444# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PROCEEDINGS OF THE SYMPOSIUM ON ELECTROMAGNETIC WINDOWS (17TH) HELD AT GEORGIA INST. OF TECHNOLOGY, ENGINEERING EXPERIMENT STATION, ATLANTA, GEORGIA ON 25-27 JULY 1984. PART 2 Final Report, 9 May 1984 - 8 May 1985
H. L. Bassett, ed. 1984 262 p
(Contract DAAG29-84-M-0346)
(AD-A149125; ARO-21807.1-MS-CF-Pt-2) Avail: NTIS HC A12/MF A01 CSCL 17/9

The Seventeenth Electromagnetic Window Symposium marks 29 years of regularly scheduled symposia on electromagnetic windows. The first seven symposia were held at Ohio State University. The Georgia Institute of Technology has hosted the symposium biennially since 1966, with the U.S. Air Force cohosting the symposia of 1966, 1968, and 1972. For individual titles, see N85-21445 through N85-21469.

N85-21445# General Dynamics Corp., San Diego, Calif. Electronics Div.
ELECTROMAGNETIC ANALYSIS OF RADOMES BY THE MOMENT METHOD
G. Tricoles, E. L. Rope, and R. A. Hayward *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 1-8 (For primary document see N85-21444 12-32)
(AD-P004351) Avail: NTIS HC A12/MF A01 CSCL 17/9

The electromagnetic performance of radomes is usually analyzed approximately by ray tracing, surface integration, or angular spectra. A significant approximation is that the radome is locally flat, and transmittance at a point is described by a set of flat sheets of infinite extent. This approximation is significant in the analysis of wave polarization dependence of boresight error, especially near the shadow of a tip where the surface normal direction varies rapidly because of circumferential curvature. This paper describes calculations for hollow wedges; these are based on a theory of J. H. Richmond for hollow cylinders of arbitrary shape. The paper also gives a new theory for hollow cones and circular rings, and it compares computed and measured phase and intensity values for a cone and a ring. GRA

N85-21446# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
A COMPUTER ANALYSIS OF THE RF PERFORMANCE OF A GROUND-MOUNTED, AIR-SUPPORTED RADOME
M. B. Punnett and E. B. Joy *In its* Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 9-16 (For primary document see N85-21444 12-32)
(AD-P004352) Avail: NTIS HC A12/MF A01 CSCL 17/9

Several reports and actual operating experience have highlighted the degradation of RF Performance which can occur when SSR or IFF antenna are mounted above primary search antenna within metal space frame or dielectric space frame radomes. These effects are usually attributed to both the high incidence angles and sensitivity of the low gain antennae to sidelobe changes due to scattered energy. Although it has been widely accepted that thin membrane radomes would provide superior performance for this application, there has been little supporting documentation. A plane-wave-spectrum (PWS) computer-based radome analysis was conducted to assess the performance of a specific air-supported radome for the SSR application. In conducting the analysis a mathematical model of a modern SSR antenna was combined with a model of an existing Birdair radome design. GRA

N85-21447# Naval Weapons Center, China Lake, Calif.
COMPARISON OF SPHERICAL WAVE RAY TRACING AND EXACT BOUNDARY VALUE SOLUTIONS FOR SPHERICAL RADOMES
D. A. Bloom, P. L. Overfelt, and D. J. White *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 17-26 (For primary document see N85-21444 12-32)

(AD-P004353) Avail: NTIS HC A12/MF A01 CSCL 17/9

Much radome analysis is based on plane wave ray tracing techniques which combine conceptual simplicity with reasonable accuracy. As increasing demands on the performance of airborne antennas necessitate more accurate methods of analysis for the enclosing radome, an exact idea of the limits of applicability of the ray-optical approximation becomes more critical. In an effort to contribute to this subject, we have taken a single layer spherical radome excited by a dipole source oriented parallel to the z-axis and computed its transmitted electric and magnetic fields using a spherical wave ray tracing technique and also by solving the electromagnetic boundary value problem exactly. The exact solution is used as a standard against which the ray tracing approximation can be compared. In this paper, we compare the field patterns of the two solutions by varying the dipole offset distance, the observation point position, wall thickness, dielectric constant, wavelength, and curvature. Parameter values and the compared field patterns are examined in terms of the theory, and conclusions are drawn as to which parameters affect agreement most strongly. Author (GRA)

N85-21448# Raytheon Co., Bedford, Mass. Missile Systems Div.

GENERALIZED RADOME BSE (RADOME BORESIGHT ERROR) CHARACTERIZATION USING SUPERPOSITION TECHNIQUES

G. Plimpton and M. Cerullo *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 27-32 (For primary document see N85-21444 12-32)

(AD-P004354) Avail: NTIS HC A12/MF A01 CSCL 17/9

Measurement of radome boresight error response to both polarization and gimbal angle variations can result in excessively long measurement times if a large number of incident polarizations are to be tested. Instead, by measuring the antenna radome system response to two orthogonal polarizations, and by using electromagnetic superposition, it is possible to completely characterize the antenna/radome BSE response as a function of any arbitrary incident polarization. This paper will focus on the details of implementing the generalized radome BSE characterization in the Bedford Automated Test Facility and will compare measured and superpositioned data. GRA

N85-21449# Middle East Technical Univ., Ankara (Turkey).

A SUBAPERTURE APPROACH TO THE CALCULATION OF FLASHLOBES INTRODUCED BY AIRBORNE RADOMES

A. Hizal, R. W. Lyon, and A. Cuthbertson *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 33-39 (For primary document see N85-21444 12-32)

(AD-P004355) Avail: NTIS HC A12/MF A01 CSCL 17/9

In airborne radomes a considerable effort has been devoted to the calculation of boresight errors but little attention has been given to the computation of flashlobes. These are caused by reflections from the radome wall and generally appear at angles well away from the boresight of the enclosed antenna. In certain circumstances they can seriously compromise the sidelobe suppression of the overall system. This paper describes an efficient method for flashlobe prediction which gives more detailed information and can be used in an optimization of radome shape and wall build. The technique is based on the subaperture method which has already been successfully used to predict other bulk radome effects. GRA

N85-21450# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.

NEAR-FIELD EFFECTS ON RADOME BORESIGHT ERRORS

G. K. Huddleston *In its* Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 41-55 (For primary document see N85-21444 12-32)

(AD-P004356) Avail: NTIS HC A12/MF A01 CSCL 17/9

A computer-aided simulation of a boresight error measurement procedure and facility was carried out to quantify the effects of separation distance and wave reflections from anechoic chamber boundaries on radome-induced boresight errors using two BSE algorithms. The 3-D radome analysis program described earlier was modified to include near-field and reflection effects. GRA

N85-21451# Flight Systems, Inc., Newport Beach, Calif.

DUAL BAND RADOME WALL DESIGN

B. J. Crowe *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 61-65 (For primary document see N85-21444 12-32)

(AD-P004357) Avail: NTIS HC A12/MF A01 CSCL 17/9

Radomes for currently-deployed air launched tactical missiles are typically designed to operate at a single frequency or narrow range of frequencies, and occasionally over a wider band of contiguous frequencies spanning an octave or slightly more. Requirements to operate against an extended threat suite, and/or to negate probable countermeasures tactics, indicate a need for future systems to encompass a multi-mode capability. Such systems will combine operations in two or more discrete segments of the electromagnetic spectrum in an integrated seeker unit. Possible mechanizations include combinations of RF/IR, IR/UV, passive RF/active RF, and microwave/millimeter wave bands. Multimode systems such as these will naturally require a matching capability from the radome. Computer analysis can permit the identification of promising wall configurations, exhibiting desirable electrical properties in physically realizable thickness combinations. This paper describes two dual-band walls designed in this manner. GRA

N85-21452# Naval Weapons Center, China Lake, Calif.

STUDY OF LAMINATED DIELECTRIC BEHAVIOR AT MICROWAVE AND MILLIMETER-WAVE FREQUENCIES

D. J. White and C. N. Helmick, Jr. *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 67-76 (For primary document see N85-21444 12-32)

(AD-P004358) Avail: NTIS HC A12/MF A01 CSCL 17/9

Dielectrics composed of layers of different dielectric constant have radome applications. A laminated or layered structure can be used to improve mechanical and thermal properties, while a certain amount of dielectric-constant tailoring can be done by varying the layer permittivities and their relative thicknesses. Such a multilayer system (sometimes called an artificial dielectric) is basically uniaxially anisotropic with the optic axis perpendicular to the planes of lamination, although this anisotropy may not be large, depending on the layer permittivities and thicknesses. In any case, the equivalent static dielectric constants for a laminated structure are readily calculated, provided the layer constants and thicknesses are known, by use of a model involving parallel and series capacitances. In this paper we explore the range of validity of the artificial-dielectric model comparing its computed results with those obtained from an N-layer flat-panel computer program for a number of specific multilayer dielectric structures. GRA

N85-21453# Israel Aircraft Industries Ltd., Lod.

IMAGE LOBE ANALYSIS FOR LARGE RADOMES

B. Pupko, D. Gordon, and S. Starobinets *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 77-83 (For primary document see N85-21444 12-32)

(AD-P004359) Avail: NTIS HC A12/MF A01 CSCL 17/9

Image lobe intensities resulting from radomes enclosing large antennas (D greater than or equal to 15 lambda) were evaluated using ray tracing and aperture integration of the reflected field. It is shown, that random phase approximation can be used when the greatest radius of curvature is less than D to the 2nd power/8 lambda. Author (GRA)

N85-21454# Brunswick Corp., Marion, Va. Defense Div.

SUPERSONIC TACTICAL MISSILE (STM) RADOME DEVELOPMENT

A. J. Thompson *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 87-96 (For primary document see N85-21444 12-32)

(Contract N00123-78-C-0074)

(AD-P004360) Avail: NTIS HC A12/MF A01 CSCL 17/9

The Supersonic Tactical Missile program included a radome development based on the geometry depicted. The nose radome was a Von Karman body of revolution, 38 inches long with a 15 inch base diameter. The enclosed radiometer system utilized a 12pen1] inch vertically polarized aperture providing four main lobes (an azimuth pair and an elevation pair) and operating over a narrow bandwidth (4.3%) centered at 235 GHz. This contrast seeker was gimballed on the radome longitudinal axis and limited to a primary tracking field of +or- 15 degrees about this axis. GRA

N85-21455# Naval Weapons Center, China Lake, Calif.
A MILLIMETER WAVE APPARATUS FOR FREE-SPACE MEASUREMENT OF DIELECTRIC CONSTANTS AT HIGH TEMPERATURE
D. R. Gagnon and D. J. White *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 99-104 (For primary document see N85-21444 12-32)
(AD-P004361) Avail: NTIS HC A12/MF A01 CSCL 17/9

Radome materials are being required to withstand increasingly higher temperatures. There is, therefore, a continuing need to measure the dielectric properties of these materials at elevated temperatures, particularly at millimeter wavelengths where the data base is still relatively sparse. At the Naval Weapons Center (NWC) an apparatus has been constructed to measure the complex transmission coefficient of flat panel samples at 35 GHz. The complex permittivity of the sample is calculated from the transmission measurements which are made in free-space bridge. GRA

N85-21456# Brunswick Corp., Marion, Va. Defense Div.
AUTOMATED RADOME TESTING
C. E. Moore and J. B. Styron *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 105-114 (For primary document see N85-21444 12-32)
(AD-P004362) Avail: NTIS HC A12/MF A01 CSCL 17/9

An automated test system has been developed for correction and electrical testing of F-16 Nose Radomes, and is currently in use. A computer control/data acquisition system is utilized in the measurement of transmission efficiency, boresight error, and radiation pattern parameters for each radome. Major components of the facility and equipment include an anechoic chamber and compact range, a five (5) axis positioner with encoders on all axes, and a control/data acquisition console. The F-16 Nose Radome is a half-wave wall utilizing filament wound construction and precision grinding to provide optimized X-band performance. GRA

N85-21457# General Electric Co., Philadelphia, Pa. Re-entry Systems Operation.
DESIGN AND CALIBRATION OF A 35GHz DIELECTROMETER
J. Hanson and J. Brazel *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 115-124 (For primary document see N85-21444 12-32)
(AD-P004363) Avail: NTIS HC A12/MF A01 CSCL 17/9

A 35 GHz (fixed frequency) dielectric measurement facility has been designed and calibrated for use in our laboratory, principally for support to development of KA band and millimeter wave radome materials. This paper describes the basic design, gives some details of the construction and electronic instrumentation and presents the results of inter-laboratory calibration on Dynasil 4000 fused quartz. Author (GRA)

N85-21458# Raytheon Co., Bedford, Mass. Missile Systems Div.
HOT RADOME BORESIGHT ERROR MEASUREMENTS
C. S. Ward, M. Cerullo, and G. Plimpton *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 125-131 (For primary document see N85-21444 12-32)
(AD-P004364) Avail: NTIS HC A12/MF A01 CSCL 17/9

A test facility has been developed which permits the convenient measurement of boresight errors on missile radomes heated to flight temperatures profiles with peak temperatures approaching 1400 deg F. Its key ingredients are an electric oven and radome conformal heat socks having independent thermostatically controlled zones to produce desired longitudinal radome temperature tapers, and infrared video equipment to remotely monitor and record radome surface temperatures. GRA

N85-21459# Brunswick Corp., Marion, Va. Defense Div.
A BROADBAND KEVLAR RADOME FOR SHIPBOARD c27
J. B. Styron and R. S. Francisco *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 135-144 (For primary document see N85-21444 12-32)
(AD-P004365) Avail: NTIS HC A12/MF A01 CSCL 17/4

A broadband radome for use on the Grumman M161 Hydrofoil craft was designed, fabricated, and tested. Dominant design considerations included electrical performance over a 2 to 18 GHz band in addition to a lightweight structure and compatibility with the shipboard environment. The requirement for a fire control radar to be mounted on top of the radome assembly also dictated a very rigid structure to minimize angular deflection errors. GRA

N85-21460# Army Materials and Mechanics Research Center, Watertown, Mass.
FIBER REINFORCED FUSED SILICA FOR HYPERSONIC RADOME APPLICATIONS c27
F. P. Meyer, G. D. Quinn, and J. C. Walck *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), part 2 1984 p 145-157 (For primary document see N85-21444 12-32)
(AD-P004366) Avail: NTIS HC A12/MF A01 CSCL 17/9

During the past few years interest in composite materials having a use temperature above 300 deg C has increased greatly. Because ceramics offer substantial increases in use temperature, much of the research has been concerned with ceramic-matrix composites. The research reported here has been undertaken as a first step in an attempt to develop a fiber reinforced fused silica composite for hypersonic radome applications. In order to maintain isotropy in the composite material and to preserve the low and very temperature-stable dielectric properties of the matrix fused silica material, it was decided to use high purity silica fibers as the reinforcement. Fused silica is an inherently low strength and low modulus material. Having an elastic modulus of about 4.5 x 10 to the 6th power almost any fiber used could increase this value considerably. GRA

N85-21461# GTE WESCO Technical Ceramics and Metals, Belmont, Calif.
PRESSURELESS SINTERED SILICON NITRIDE AS A PROMISING CANDIDATE FOR RADOME MATERIALS c27
M. Y. Hsieh, H. Mizuhara, and P. W. Smith *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 159-165 (For primary document see N85-21444 12-32)
(AD-P004367) Avail: NTIS HC A12/MF A01 CSCL 17/9

Pressureless sintered silicon nitride has several favorable features and properties which make it a promising candidate for radome materials. First of all, pressureless sintering provides relatively unlimited shape forming capabilities. Process can be controlled reproducibly. Parts can be made relatively inexpensive. Pressureless sintered silicon nitride provides some excellent physical and mechanical properties which approach hot pressed silicon nitride. GRA

N85-21462# Brunswick Corp., Marion, Va. Defense Div.
LL-100: A NEW POLYBUTADIENE (RESIN SYSTEM FOR RADOME APPLICATIONS) c27
G. W. Eastridge *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 167-175 (For primary document see N85-21444 12-32)
(AD-P004368) Avail: NTIS HC A12/MF A01 CSCL 17/9

Low dielectric and loss tangent properties make the LL-100 System extremely attractive for radome applications. The

LL-100 Polybutadiene also costs typically the same as an Epoxy System and processes like an epoxy. Unlike epoxies, however, the LL-100 System may be utilized for extended periods at 450 deg F similar to BMI Polymide Systems. The LL-100 Prepreg has excellent tack and drape and requires no refrigerated storage. This system has been utilized successfully for radome applications up to 94 GHz without substantial change in electrical properties.
Author (GRA)

N85-21463# Texas Instruments, Inc., Dallas.
BROADBAND THERMOPLASTIC RADOMES **c27**
K. Hollenbeck and M. Rehrl *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 177-185 (For primary document see N85-21444 12-32)
(AD-P004369) Avail: NTIS HC A12/MF A01 CSCL 17/9

Radomes requiring frequency coverage from S through K band present a difficult design challenge. Past experience with broadband antenna systems has shown that a low fines ratio A sandwich radome offers the best electrical performance. However, a blunt A sandwich which performs well electrically typically has skins which are too thin to provide adequate rain erosion and ground handling protection. Therefore, the designer has been forced to either sacrifice electrical performance or face increased rain erosion and ground handling damage. To achieve the necessary electrical and mechanical properties, new radome designs incorporating thermoplastic materials have been developed. These new thermoplastic radomes can meet both the mechanical and electrical requirements while remaining relatively low cost. GRA

N85-21464# GTE Labs., Inc., Waltham, Mass.
PROGRESS ON TRANSPARENT YTTRIA **c27**
W. H. Rhodes and E. A. Trickett *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 187-194 (For primary document see N85-21444 12-32)
(Contract N00014-82-C-0452)
(AD-P004370) Avail: NTIS HC A12/MF A01 CSCL 11/2

La203 - doped Y203 is of interest for infrared applications because it is one of the longest wavelength transmitting oxides. It is refractory with a melting point of 2430 deg C and has a moderate expansion coefficient. The thermal shock and erosion resistance is considered to be intermediate among the oxides, but outstanding compared to non-oxide infrared materials. A major consideration is the low emissivity of Y203 which limits background radiation upon heating. It is also known that the phonon edge gradually moves to shorter wavelengths as a material is heated. GRA

N85-21465# Army Missile Lab., Redstone Arsenal, Ala.
DEVELOPMENT OF A HIGH TEMPERATURE SINGLE IMPACT RAIN EROSION TEST CAPABILITY **c09**
K. N. Letson and S. P. Risner *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 195-206 (For primary document see N85-21444 12-32)
(AD-P004371) Avail: NTIS HC A12/MF A01 CSCL 17/9

A single impact rain erosion test capability has been developed to obtain data on fiber loaded Teflon (e.g., Duroid) ablative radome materials at temperatures up to their ablating temperature (approx. 1250 F). This effort was undertaken as a result of the prior inability to: (1) obtain experimental data for single water droplet impacts on these materials at temperatures significantly above 400 F at velocities near Mach 5, and (2) identify a solid particle whose behavior is similar to or can be correlated to that of water droplets at all conditions of interest. This test capability allows one to dispense a stream of calibrated discrete water droplets in the path of aerodynamically heated samples on sleds at velocities up to 6000 ft/sec. GRA

N85-21466# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Recherches Aerospatiales.
INFRARED MATERIAL OPTICAL DAMAGE BY RAIN **c24**
A. Deom, G. Gauffre, and D. L. Balageas *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 207-213 Original language document was announced in IAA as A84-45206 (For primary document see N85-21444 12-32)
(AD-P004372) Avail: NTIS HC A12/MF A01 CSCL 20/6

A comprehensive study of the optical damage and erosion of various infrared materials is conducted using a rotating arm. The optical damage is characterized by the evolution of the sample modulation transfer function (MTF). The velocity dependence for MTF deterioration is similar to that of the mass loss: occurrence time of damages is inversely proportional to a high-exponent power law of the velocity. For some materials like magnesium fluoride (MgF2), the optical damage occurs in synchronism with the erosion. Inversely, for others like zinc selenide (AnSe), optical damage occurs very early before the beginning of the erosion. Consequently, the screening of candidate materials for irdome must be based on transmission tests, or better on MFT tests, rather than on erosion tests. Author (GRA)

N85-21467# Electronic Space Systems Corp., Concord, Mass.
A RADOME FOR AIR TRAFFIC CONTROL SSR RADAR SYSTEMS
In Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 219-224 (For primary document see N85-21444 12-32)
(AD-P004373) Avail: NTIS HC A12/MF A01 CSCL 17/9

A new generation of monopulse and discrete interrogation systems has evolved for air traffic control applications that presents significant challenges to total system design and performance. Reliable operation of the antenna system is essential in today's ever increasing air traffic congestion. An important component of the total system is a radome to protect the antenna from the environment and to enable consistent, reliable electromagnetic performance. The various types of radomes that have been employed over the years to protect antennas are discussed and evaluated relative to the air traffic control radar application. The sandwich radome is selected as the best option and a detailed design analysis is presented which considers the vital characteristics of transmissivity, boresight error, and sidelobe perturbations.
GRA

N85-21468# Northrop Corp., Hawthorne, Calif. Aircraft Group.
DEVELOPMENT OF THE F-20 NOSE RADOME
E. L. Cain and P. Tulyathan *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 225-235 (For primary document see N85-21444 12-32)
(AD-P004374) Avail: NTIS HC A12/MF A01 CSCL 17/9

Northrop's newest fighter aircraft, the F-20 Tigershark, is based on the successful aerodynamic design and size of the F-5 Tiger II aircraft. It has a single engine providing 80 percent more thrust than that of the twin-engine Tiger II, digital avionics, and a newly designed AN/APG-67 (V) X-band radar. This coherent pulse Doppler radar provides both look-up and look-down target detection and tracking. Successful operation of this radar necessitated an antenna/radome system which provides low RMS side-lobe levels to minimize false alarm rate in the look-down mode, and high antenna gain/low radome loss to maximize radar range. These system requirements prompted a redesign of the F-5 Shark Shape nose section which had been aerodynamically configured to improve the post-stall handling qualities of the Tiger II aircraft. The design change included: (1) provisions for a larger radar antenna, (2) a clean radome, i.e., no pitot-static probe, air lines or heater wires, and (3) a blunted radome shape, designed to preserve aerodynamic handling qualities and provide the required electrical characteristics. GRA

N85-21469# Brunswick Corp., Marion, Va. Defense Div.
NOSE AND INLET DUCT RADOMES FOR THE FIREBOLT AERIAL TARGET
L. C. Hoots *In* Georgia Inst. of Technology Proc. of the Symp. on Electromagnetic Windows (17th), Part 2 1984 p 237-246 (For primary document see N85-21444 12-32)
(AD-P004375) Avail: NTIS HC A12/MF A01 CSCL 17/9

Radomes of the Firebolt Aerial Target (AQM-81A) facilitate an uncommon set of operational conditions. The target vehicle is

first carried captively. Stones may be dislodged from the runway and impact the Nose or Inlet Duct Radomes with considerable force. The drone has various flight profiles after launch, encompassing levels of MACH 1.2 at 35,000 feet to MACH 4 at 100,000 feet. For flights of 10 minutes, attendant aerothermal loads produce temperature peaks of 680 deg F and 980 deg F for the Nose and Inlet Duct units, respectively. Firebolt is normally retrieved, by helicopter after its parachute deploys, for refurbishment and re-use. Occasionally, sea recovery is effected using flotation gear. Electrically, the Nose Radome accommodates an L-band antenna for the electronic scoring system, and a small circulary polarized X-band horn. The Inlet Duct Radome houses an identical broad-beamed horn. Author (GRA)

N85-21470# Stanford Univ., Calif. Space Telecommunications and Radioscience Lab.

THE ULF/ELF/VLF ELECTROMAGNETIC FIELDS GENERATED IN A SEA OF FINITE DEPTH BY ELEVATED DIPOLE SOURCES Final Technical Report, 1 Jul. 1979 - 31 Dec. 1982

A. C. Fraser-Smith and D. M. Bubenik (SRI International, Menlo Park, Calif.) Sep. 1984 93 p
(Contract N00014-77-C-0292)
(AD-A149638; SU-FTR-E715-2) Avail: NTIS HC A05/MF A01 CSCL 20/14

Results are presented of a study of the amplitudes of the quasi-static electromagnetic fields produced in, on, and above the surface of a sea of finite depth by vertically-directed harmonic electric and magnetic dipoles (VED's and VMD's, respectively) and horizontally-directed harmonic electric and magnetic dipoles (HED's and HMD's, respectively). In a previous report and publication we presented numerical data for the fields produced on and above the surface of the sea by the dipole sources when submerged in the sea. We now present data for the fields produced in the sea by the same dipole sources when they are either on or elevated above the surface. The primary purpose of these computations is to determine the conditions under which an electrically-conducting sea bed can produce significant changes in the fields generated by the dipoles, as compared with the fields produced in, on, and above an infinitely deep sea, for frequencies in the ULF, ELF, and VLF bands (frequencies less than 30 kHz). The present work shows that the fields produced in the sea by elevated dipoles are comparatively little affected by the presence of the sea floor. GRA

N85-21471# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.

RADIO FREQUENCY RADIATION (RFR) MEASUREMENTS IN OPERATIONAL SETTINGS Summary Report

R. B. Graham Dec. 1984 23 p
(AD-A149717; OEHL-85-028CV111ARA) Avail: NTIS HC A02/MF A01 CSCL 14/2

This report is an overview and summary of how the USAF carries out the field measurement aspects of the radiofrequency radiation protection program and offers some broad guidelines as to how other agencies might accomplish the same mission. GRA

N85-21472# Systems Research Labs., Inc., Dayton, Ohio.

THE EFFECT OF JAMMING/DECEPTION ON DECISION MAKING Final Interim Report, Oct. 1982 - May 1984

M. A. Felkey, D. L. Monk, and L. J. Stec Oct. 1984 49 p
(Contract F33616-82-C-0511)
(AD-A149740; AFAMRL-TR-84-055) Avail: NTIS HC A03/MF A01 CSCL 17/4

The present experiment examined the capability of developing a simulation methodology for assessing the effects of Command, Control, and Communications CounterMeasures (C3CM) on a human operator. Primarily, the effects on human information jamming and deception were applied against a key decision maker in a simulated, air defense, C3 system were assessed. The man-in-the-loop simulation provides real human operator data and a methodology to assess human operator performance. The subjects' performance exhibited trends from which certain strategies were assessed. Results indicated that operator uncertainty and loss of confidence in ambiguous situations did not exist. Specifically, the subjects relied on the most timely information channel. Performance was worse when that channel was jammed. Also, the condition that degraded performance the most was when the most timely channel was jammed and the most precise channel contained deceptive information. GRA

N85-21473# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.

A MOMENT SOLUTION FOR AN ARBITRARY CONFIGURATION OF PARTLY SHIELDED WIRES ABOVE A GROUND PLANE

J. R. Mautz and R. F. Harrington Dec. 1984 122 p
(Contract N00014-76-C-0225)
(AD-A149762; SYRU/DECE/TR-84/8; TR-27) Avail: NTIS HC A06/MF A01 CSCL 20/3

A moment solution is constructed for the electric current induced on an arbitrary configuration of partly shielded wires placed in the free-space region above a perfectly conducting infinite plane and illuminated either by the time-harmonic electromagnetic field of a current element or by an incident plane wave. The wires are partly shielded in that they pass through various lengths of thin perfectly conducting tubing. The wires are arbitrarily bent. The thin wire approximation is used for the portions of wire directly exposed to the incident field and for the exterior surfaces of the sheaths of tubing. The coaxial region between any wire and its sheath is treated as an ordinary transmission line. The moment solution is implemented by computer programs which are described and listed. Some numerical results are presented. Author (GRA)

N85-21474# RAND Corp., Santa Monica, Calif.

BASE COMMUNICATIONS ISSUES FOR THE 1980S Interim Report

W. H. Ware, R. M. Paulson, and M. M. Balaban Sep. 1984 51 p
(Contract F49620-82-C-0018)
(AD-A149764; RAND/N-2164-AF) Avail: NTIS HC A04/MF A01 CSCL 17/2

This note examines the role of the Air Force Communications Command (AFCC) in providing base-level communications, including transmission and reception of voice, message, and data traffic and support of automatic data processing (ADP). It identifies some of the problems faced by AFCC in planning for systems that will meet future intrabase and base/off-base communications requirements within the current structure of Command-level controls. It recommends that the AFCC do the following: (1) Create a form for adjudicating competing user needs and generating a comprehensive statement of user requirements; (2) create a computer-based, on-line user requirements database that will be continually updated and refined; (3) examine, with support from the Electronic Systems Division (ESD), the possibility of collecting traffic characteristics and traffic-flow data for representative bases of each major command; (4) acquire the support of ESD for certain communications-related R&D tasks; (5) arrange with other commands to jointly assess the usefulness of contemporary communications equipment; (6) revise its mission statement to reflect the broader, more responsible mission it must have for the Air Force. That broader mission is summarized in a related Rand study, N-2162-AF. Author (GRA)

N85-21475# Raytheon Co., Goleta, Calif. Electromagnetic Systems Div.

3-D DOME/ROTMAN LENS ANTENNA BREADBOARD DEMONSTRATION Final Report, Jan. 1979 - Jan. 1982

D. T. Thomas and D. Holst Arlington, Va. ONR Jan. 1985 151 p
(Contract N00014-80-C-0143)
(AD-A149809; ONR-252-008-3) Avail: NTIS HC A08/MF A01 CSCL 09/5

This report describes a 3-D Dome/Rotman Lens Antenna preliminary system design, and also a demonstration of the critical hardware is given. It offers the capability for: (1) greater than hemisphere scan coverage from a single feed array, (2) greater than octave bandwidth, and (3) multiple simultaneous beams. The

history and selected results of related programs are included.
Author (GRA)

N85-21476# Texas Univ., Austin. Dept. of Electrical and Computer Engineering.
THE STUDY OF CERTAIN ASPECTS OF PROBABILITY WITH APPLICATIONS IN COMMUNICATIONS THEORY Interim Report, 1 Oct. 1983 - 30 Sep. 1984
G. L. Wise 28 Nov. 1984 19 p
(Grant AF-AFOSR-0047-81)
(AD-A149820; AFOSR-84-1184TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

This interim report constitutes a summary of research performed under the grant during this period. First the author presents a list of personnel involved in the research effort. In the next section the author presents a summary of research results that have been achieved. Then in the following section the author briefly comments upon the research in progress. This is followed by a list of publications supported during this grant year. Most research results are in the areas of quantization theory and detection theory. Quantization is the process by which data is reduced to a simpler, more coarse representation which is more compatible with digital processing. Loosely speaking, quantization is the heart of analog to digital conversion. It is an area which has increased in importance in the last few years due to the burgeoning advances in digital technology. The typical goal of quantization is to reduce data to a simplier representation without causing much distortion; that is, the output of a quantizer should be close to the input, with some appropriate measure of distance. Another research area in which we have recently obtained results is the area of signal detection. The detection problem is modeled as a test between two statistical hypotheses; we assume that under the null hypothesis noise alone is being observed, and under the alternate hypothesis a signal plus noise is being observed. We considered discrete time detection. GRA

N85-21477# Southern Methodist Univ., Dallas, Tex. Dept. of Electrical Engineering.
SPREAD SPECTRUM MOBILE RADIO COMMUNICATIONS Interim Report, 1 Sep. 1982 - 31 Aug. 1984
S. C. Gupta, R. Viswanathan, R. Sinha, and R. Muammar 15 Sep. 1984 88 p
(Grant AF-AFOSR-0309-82)
(AD-A149936; AFOSR-84-1217TR) Avail: NTIS HC A05/MF A01 CSCL 17/2

In this report, we present some additional results on the performance of Frequency Hopped Multilevel FSK (FH-MFSK) systems under mobile environment. This is followed by a review on packet radio networks and some results on the performance of a packet transmission technique in mobile radio channels. Simulation studies confirm the theoretical performance estimate of a FH-MFSK hard-limited receiver operating under adjacent cell interference conditions. Both simulation and approximate theoretical considerations testify the usefulness of a nonparametric receiver based on rank-sums. This receiver also possesses a robustness against changing probability models. It is believed that this receiver is a competing alternative to the parametric receivers, such as the hard-limited receiver. GRA

N85-21478# Megapulse, Inc., Bedford, Mass.
SURVIVABLE PROPAGATION Final Technical Report, May 1981 - Jun. 1984
Frederick M. Tingley Griffiss AFB, N.Y. RADC Nov. 1984 19 p
(Contract F19628-80-C-0146; AF Proj. 4600)
(AD-A150070; RADC-TR-84-218) Avail: NTIS HC A02/MF A01 CSCL 20/14

The report consists of a summary of work performed under this contract, involving several aspects of the propagation of electromagnetic waves. Subjects covered include survivability of transverse electric propagation, meteor burst propagation, radiation properties of corona discharge and spaced arrays for noise nulling. Overviews of each study are presented along with references to internal and published interim reports generated during the period of performance of the contract. GRA

N85-21479# M/A-COM DDC, Inc., Germantown, Md.
DIGITAL CHANNEL EFFICIENCY MODEL Final Technical Report, Nov. 1980 - Jun. 1984
D. R. Lowe Griffiss AFB, N.Y. RADC Sep. 1984 137 p
(Contract F30602-81-C-0025; AF Proj. 2157)
(AD-A150084; RADC-TR-84-178) Avail: NTIS HC A07/MF A01 CSCL 17/2

This report describes the design, fabrication, and testing of a bit rate reduction system, The Digital Channel Efficiency Model (DCEM) effectively doubles the transmission bandwidth (number of channels) of digital communications systems, by providing an overall 2:1 compression of DCM signals, either DCS or NATO, transparent to any users, with no modifications of existing equipment. The DCEM also provides a variety of DCS-NATO interface modes at the digroup level. GRA

N85-21480# Science Applications, Inc., La Jolla, Calif.
IMPROVEMENT OF VHF(MB) MODEL
David Sachs 12 Nov. 1984 82 p
(Contract N00039-81-C-0654)
(AD-A150087; SAIC-84/1634) Avail: NTIS HC A05/MF A01 CSCL 17/2

The improvement of a VHF(MB) link performance model is described which consists of a program which evaluates signal reflecting properties and average rate of occurrence of meteor trails for elements of area of sky at 100 km altitude within the horizons for surface antennas. Probabilities of message receipt are obtained by combining probabilities for each sky element. Both overdense and underdense meteor trails are considered. GRA

N85-21481# Massachusetts Inst. of Tech., Cambridge. Spectroscopy Lab.
EXPLORATION OF NEW METHODS TO PRODUCE EFFICIENT SOURCES OF COHERENT NEAR MILLIMETER WAVE RADIATION Final Report, Nov. 1982 - May 1984
Michael S. Feld, Ramachandra R. Dasari, and John E. Thomas 16 Nov. 1984 20 p
(Grant DAAG29-83-K-0017)
(AD-A150094; ARO-19608.1-PH) Avail: NTIS HC A02/MF A01 CSCL 17/5

A summary is presented of a feasibility study for a new concept photon recycling which was proposed as a new means of generating near millimeter wave radiation using gas dynamic cooling. A general theoretical analysis of this concept is presented which shows that small partition fractions and low temperatures lead to an unwieldly geometry for the nozzle design. GRA

N85-21482# Army Military Personnel Center, Alexandria, Va.
THE AMBIGUITY FUNCTION AND THE WIGNER DISTRIBUTION Final Report M.S. Thesis
David C. Kirk 1 Apr. 1984 87 p
(AD-A150095) Avail: NTIS HC A05/MF A01 CSCL 17/9

This paper compares the radar ambiguity function and the Wigner distribution. Both functions are time-frequency representations of a given signal. The properties of each function are presented and their relationship is demonstrated. Emphasis is placed on how each function relates to the Heisenberg uncertainty principle. GRA

N85-21483# Pennsylvania Univ., Philadelphia. Electro-optics and Microwave-optics Lab.
RESEARCH IN IMAGE UNDERSTANDING AS APPLIED TO 3-D TOMOGRAPHIC IMAGING WITH NEAR OPTICAL RESOLUTION Annual Report, 1 Jul. 1983 - 31 Aug. 1984
N. H. Farhat, T. H. Chu, L. S. Chang, D. Jaggard, K. Schultz, and C. L. Werner 30 Nov. 1984 129 p
(Grant AF-AFOSR-0240-81; AF Proj. 2305)
(AD-A150098; EO/MO-7; AFOSR-84-1230TR) Avail: NTIS HC A07/MF A01 CSCL 17/9

Our research in high resolution microwave imaging has to

date focused broadly on the study and development of efficient and cost-effective data acquisition and image reconstruction methods for use in lambda and polarization diversity 3-D tomographic imaging. The techniques developed, combine angular, spectral, and polarization diversity measurements with a unique target derived reference (TDR) technique to produce images of the scattering centers on complex-shaped bodies with unprecedented resolution and quality, as reported here, that exceed by far anything reported to this date. Analytical studies of information content, speckle suppression, and resolution show however that image quality can further be enhanced and made to approach and even exceed the resolution of optical systems when the imaging of remote objects specially through the Earth's atmosphere is desired. GRA

N85-21484# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

ELECTROMAGNETIC PULSE (EMP) INJECTION ON CABLE ENTRIES, TYPE ERA; EMP MEMO NO. 10

Oerjan Borgefalk and Torsten Dikvall Nov. 1984 24 p In SWEDISH; ENGLISH summary
(FOA-E-30003-A3; ISSN-0281-9937) Avail: NTIS HC A02/MF A01

Measurements on a cable entry type ERA for testing its capability of diverting EMP from cables to a shielding structure were made. The cable entry is constructed according to the module principle to be fitted into complete structures and installations. The measurements were made at different values for the time derivatives of the current. Results show that the diverting properties of the cable entry are satisfactory, providing the tightening pressure is (and remains) good, between the cable entry and the cable shield. Author (ESA)

N85-21485# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung HF-Physik.

PROSPECTIVE INVESTIGATIONS WITH DFVLR RADAR OF POSSIBLE RELEVANCE IN THE ASSESSMENT OF RADIO INTERFERENCE DUE TO SCATTERING FROM PRECIPITATIONS

Madhu Chandra, Arno Schroth, and Ernst Lueneburg Jul. 1984 68 p refs
(DFVLR-FB-84-42; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23.50

A coherent polarimetric weather radar is described. The radar technique for remotely sensing meteorological precipitations is generalized and applied to hydrometeor volumes capable of producing significant electromagnetic scattering. The impact of the radar on the characterization of the distribution and the thermodynamic phase of the hydrometeors is discussed. The polarimetric capabilities of the radar in characterizing the propagation medium and the removal of propagation effects present in the radar echoes are outlined. A T-matrix method for calculating scattering properties of double-layer hydrometeors is presented. Author (ESA)

N85-21486# National Bureau of Standards, Gaithersburg, Md. Electromagnetic Technology Div.

METROLOGY FOR ELECTRONIC TECHNOLOGY: A BIBLIOGRAPHY OF NBS (NATIONAL BUREAU OF STANDARDS)

R. A. Kamper and K. E. Kline Jul. 1984 66 p
(PB85-112895; NBSIR-84-3014) Avail: NTIS HC A04/MF A01 CSCL 14B

This bibliography lists the publications of the personnel of the Electromagnetic Technology Division of National Bureau of Standards in the period from January 1970 through December 1983. A few earlier references that are directly related to the present work of the Division are included. Author (GRA)

N85-21487# National Telecommunications and Information Administration, Washington, D.C.

MEASUREMENTS AND PREDICTIONS OF HF GROUND WAVE RADIO PROPAGATION OVER IRREGULAR, INHOMOGENEOUS TERRAIN

J. E. Adams, J. C. Carroll, E. A. Costa, D. R. Ebaugh, Jr., J. R. Godwin, E. J. Haakinson, D. H. Layton, and D. Smith Jul. 1984 152 p refs
(PB85-110666; NTIA/Rept-84-151) Avail: NTIS HC A08/MF A01 CSCL 17B

Measurements of radio propagation path loss were made over four paths in the 3 to 30 MHz band. The paths were of lengths up to 45 km. They ranged from smooth to mountainous terrain, from open areas with few or no man-made structures to suburban areas with building heights up to three stories, and from open spaces with little vegetation to heavily forested regions. On one path, measurements were made with and without snow cover. The measurements were made in the daytime and because of the short paths, the primary mode of propagation was ground wave. Measurements of the ground constants at each of the four measurement frequencies were made at the transmitter site using the wave-tilt measurement technique. GRA

N85-21488# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

SAMPLE SIZE AND PRECISION IN COMMUNICATION PERFORMANCE MEASUREMENTS

Martin J. Miles Aug. 1984 130 p
(PB85-1143270; NTIA/Rept-84-153) Avail: NTIS HC A07/MF A01 CSCL 17B

An interactive computer program that facilities efficient measurement of communication system performance parameters was developed. The program performs three primary functions: (1) determines the minimum sample size required to achieve a desired precision in estimating delay, rate, or failure probability parameters; (2) analyzes measurement results to determine the precision achieved; and (3) tests independent sets of measured data for statistical homogeneity. The program was written specifically to facilitate measurement of the performance parameters defined in a Data Communication Standard X3.1:002. The statistical techniques implemented in it may also be applied to any other delay, rate, or failure probability measurement. GRA

N85-21489# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

OPTICAL FIBER COMMUNICATIONS LINK DESIGN IN COMPLIANCE WITH SYSTEMS PERFORMANCE STANDARDS

J. A. Hull and A. G. Hanson Aug. 1984 127 p refs Sponsored in part by National Communcations System, Army and Navy
(PB85-111037; NTIA/Rept-84-154) Avail: NTIS HC A07/MF A01 CSCL 17B

An engineering approach to the design of optical fiber communication links to meet mandated specifications for performance and interoperability is described. The engineering approach should be useful in the implementation of other Government and voluntary standards under development. Author (GRA)

N85-21490# National Academy of Sciences - National Research Council, Washington, D. C.

AUTOMATIC SPEECH RECOGNITION IN SEVERE ENVIRONMENTS Final Report

1984 92 p refs
(Grant N00014-830-G-0072)
(PB85-121697) Avail: NTIS HC A05/MF A01 CSCL 17B

Human-machine interaction by voice was analyzed. The potential for improving the safety and effectiveness of its forces by making electronic and electromechanical devices directly responsive to the human voice and able to respond by voice is recognized. The benefits of this capability are noteworthy in situations where the individual is engaged in such hands/eyes-busy tasks as flying an airplane or operating a tank. Voice control of navigational displays, information files, and weapons systems could relieve the information loads on visual and manual channels. GRA

N85-21200*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
USE OF GROUND RADAR TO DETECT REENTERING DEBRIS
Jeanne Lee Crews *In its* Orbital Debris Mar. 1985 p 164-169 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 17I

N85-21534# Joint Publications Research Service, Arlington, Va.
SATELLITE COMMUNICATIONS AND AMATEUR RADIO Abstract Only
A. Abolits *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 2-3 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 21-22 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21535# Joint Publications Research Service, Arlington, Va.
AUTOMATIC PICKUP OF TRAJECTORY BY METHOD OF SEQUENTIAL ANALYSIS TAKING INTO ACCOUNT DEVIATION OF RADAR MARKERS FROM CENTER OF STROBE Abstract Only
V. A. Kulikov and M. M. Sapov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 4 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 28-30 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21536# Joint Publications Research Service, Arlington, Va.
PERFORMANCE RANGES OF HELICAL ANTENNA MADE OF CONDUCTOR WITH EXTRA BENDS Abstract Only
V. I. Demidchik *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 5 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 77-79 (For primary document see N85-21531 12-31)
Avail: NTIS HC A04/MF A01

N85-21539# Joint Publications Research Service, Arlington, Va.
SUMMATOR OF RADIO PULSE SIGNALS Abstract Only
V. S. Mostyko and K. V. Ivanov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 10 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 83-85 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21540# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY INPUT DEVICE FOR SUPERHETERODYNE RADIO RECEIVER WITH WIDEBAND PRESELECTOR Abstract Only
S. M. Sarayev *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 11 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 37-40 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21541# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF OPTIMUM RECEIVER AND PROCESSOR FOR SIGNAL PACKET OF RADIO PULSES Abstract Only
A. L. Ryabtsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 11-12 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 21-24 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21547# Joint Publications Research Service, Arlington, Va.
OPTIMAL THRESHOLD AND WEIGHT SORTING OF ELEVATION ANGLE READINGS UNDER CONDITIONS OF FADEOUTS OF A DIRECTED SIGNAL Abstract Only
V. V. Perkov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 22 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 24-28 Original language' document announced as 85A-15764 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21548# Joint Publications Research Service, Arlington, Va.
MULTICHANNEL DIGITAL PROCESSING OF WIDEBAND SIGNALS Abstract Only
M. M. Milykh and V. F. Struchev *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 22-23 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 3-8 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21550# Joint Publications Research Service, Arlington, Va.
OPTIMAL DISCRETE FILTRATION OF INTRICATE PHASE-KEYED SIGNALS Abstract Only
G. I. Tuzov, V. V. Gorshkov, and S. A. Rubtsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 24 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 55-58 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21551# Joint Publications Research Service, Arlington, Va.
ADAPTIVE REGULATION OF TRANSMITTER RADIATION POWER IN RADIO LINES DURING DELAYS OF CONTROL SIGNALS Abstract Only
A. G. Onyshko and V. P. Postyushkov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 24 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 36-37 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21559# Joint Publications Research Service, Arlington, Va.
DETERMINING DISTRIBUTION OF COMPLEX DIELECTRIC PERMITTIVITY OVER CYLINDRICAL BODY OF INTRICATE CROSS SECTION FROM ELECTROMAGNETIC FIELD MEASUREMENT Abstract Only
Ivan Petrovich Stadnik, Irina Yuryevna Gorskaya, and Sergey Pavlovich Kulikov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 15-20 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21560# Joint Publications Research Service, Arlington, Va.
ALGORITHM FOR STATISTICAL SIMULATION OF ELECTROMAGNETIC COMPATIBILITY CHARACTERISTICS OF HIGH-FREQUENCY TRANSMISSION CHANNELS IN RADIOELECTRONIC FACILITIES Abstract Only
Y. M. Ilin and S. V. Mints *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 36 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 33-35 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-22312*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A NEW RADIO EMISSION AT 3 kHz IN THE OUTER HELIOSPHERE
W. S. Kurth (Iowa Univ., Iowa City), D. A. Gurnett (Iowa Univ., Iowa City), F. L. Scarf (TRW Space Technology Labs., Redondo Beach, Calif.), and R. L. Poynter *In* ESA Plasma Astrophys. Nov. 1984 p 285-288 refs (For primary document see N85-22270 12-90)
(Grant NAGw-386; Contracts JPL-954012; JPL-954013)
Avail: NTIS HC A15/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-21491* National Aeronautics and Space Administration. Pasadena Office, Calif.
HOLLOW CATHODE APPARATUS Patent
Graeme Aston, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 2 Oct. 1984 6 p Filed 22 Jun. 1981 Supersedes N84-16993 (22 - 07, p 1076) Sponsored by NASA (NASA-Case-NPO-15560-1; NAS 1.71:NPO-15560-1; US-Patent-4,475,063; US-Patent-Appl-SN-275909; US-Patent-Class-315-111.81; US-Patent-Class-315-111.31; US-Patent-Class-313-131A; US-Patent-Class-250-426) Avail: US Patent and Trademark Office CSCL 09A

A hollow cathode apparatus is described, which can be rapidly and reliably started. An ignitor positioned upstream from the hollow cathode, generates a puff of plasma that flows with the primary gas to be ionized through the cathode. The plasma puff creates a high voltage breakdown between the downstream end of the cathode and a keeper electrode, to heat the cathode to an electron-emitting temperature.
Official Gazette of the U.S. Patent and Trademark Office

N85-21492* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INELASTIC TUNNEL DIODES Patent
Lynn M. Anderson, inventor (to NASA) Issued 13 Nov. 1984 7 p Filed 19 Apr. 1983 Supersedes N83-25983 (21 - 15, p 2390) (NASA-Case-LEW-13833-1; NAS 1.71:LEW-13833-1; US-Patent-4,482,779; US-Patent-Appl-SN-486471; US-Patent-Class-136-255; US-Patent-Class-357-12; US-Patent-Class-357-30) Avail: US Patent and Trademark Office CSCL 09A

Power is extracted from plasmons, photons, or other guided electromagnetic waves at infrared to midultraviolet frequencies by inelastic tunneling in metal-insulator-semiconductor-metal diodes. Inelastic tunneling produces power by absorbing plasmons to pump electrons to higher potential. Specifically, an electron from a semiconductor layer absorbs a plasmon and simultaneously tunnels across an insulator into metal layer which is at higher potential. The diode voltage determines the fraction of energy extracted from the plasmons; any excess is lost to heat.
Official Gazette of the U.S. Patent and Trademark Office

N85-21493* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR SELF-CALIBRATION AND PHASING OF ARRAY ANTENNA Patent
Chialin Wu, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 11 Dec. 1984 11 p Filed 30 Jul. 1982 Supersedes N82-33593 (21 - 24, p 3423) (NASA-Case-NPO-15920-1; NAS 1.71:NPO-15920-1; US-Patent-4,488,155; US-Patent-Appl-SN-403848; US-Patent-Class-343-376; US-Patent-Class-343-17.7) Avail: US Patent and Trademark Office CSCL 09C

A technique for self-calibrating and phasing a lens-feed array antenna, while normal operation is stopped, utilizes reflected energy of a continuous and coherent wave broadcast by a transmitter through a central feed while a phase controller advances the phase angles of reciprocal phase shifters in radiation electronics of the array elements at different rates to provide a distinct frequency modulation of electromagnetic wave energy returned by reflection in one mode and leakage in another mode from the radiation electronics of each array element. The composite return signal received by a synchronous receiver goes through a Fourier transform processing system and produces a response function for each antenna element. Compensation of the phase angles for the antenna elements required to conform the antenna response to a precomputed array pattern is derived from the reciprocal square root of the response functions for the antenna elements which, for a rectangular array of NXM elements, is a response function T(n,m). A third mode of calibration uses an external pilot tone from a separate antenna element. Respective responses are thus obtained from the three modes of calibration.
Official Gazette of the U.S. Patent and Trademark Office

N85-21494 Department of the Air Force, Washington, D.C.
METHOD FOR THE FABRICATION OF DIELECTRIC ISOLATED JUNCTION FIELD EFFECT TRANSISTOR AND PNP TRANSISTOR Patent
K. F. Cunniff, inventor (to Air Force) Issued 13 Nov. 1984 6 p Supersedes AD-D010135 (AD-D011500; US-Patent-4,481,707; US-Patent-Appl-SN-469370; US-Patent-Class-29-580) Avail: US Patent and Trademark Office CSCL 09/1

The process of fabricating a dielectrically isolated junction field effect transistor and a PNP transistor on a common substrate is described. An epitaxially layer is deposited on the base substrate to form the channel region of the junction field effect transistor. Impurities for the source and drain of the field effect transistor are diffused into the epitaxial layer. Impurities to form the gate are diffused into the epitaxially layer between the source and gate regions but separated therefrom. The PNP transistor which is dielectrically isolated from the field effect transistor by grooves, is formed by the diffusion into the base substrate of the respective impurities that form the base, collector and emitter regions of the PNP transistor. GRA

N85-21495 Department of the Air Force, Washington, D.C.
DEPLOYABLE FOLDED ANTENNA APPARATUS Patent
F. V. Bilek and D. N. Buell, inventors (to Air Force) Issued 13 Nov. 1984 10 p (AD-D011503; US-Patent-4,482,900; US-Patent-Appl-SN-417726; US-Patent-Class-417-726) Avail: US Patent and Trademark Office CSCL 09/5

An antenna apparatus for use in space which is foldable into a small package for storage in a space vehicle is described. The antenna apparatus utilizes a plurality of hinged members and diagonal tapes forming parallelogram frames, two opposite sides of which are hinged at the center to fold the frames in a given plane. Similar frames are hinged on the first frames in a second plane whereby a plurality of cubes are formed when all are unfolded. Author (GRA)

N85-21496 Department of the Air Force, Washington, D.C.
POWER CIRCUIT UTILIZING SELF-EXCITED HALL EFFECT SWITCH MEANS Patent
P. J. Turchi, inventor (to Air Force) Issued 27 Nov. 1984 6 p (AD-D011505; US-Patent-4,485,314; US-Patent-Appl-SN-469176; US-Patent-Class-307-308) Avail: US Patent and Trademark Office CSCL 09/5

A power circuit utilizes a switch comprised of Hall-effect-active resistive elements for interrupting a current flow in an inductive energy storage system. Interruption of the flow of current causes a high-voltage pulse which drives the current flow into a circuit leg which is parallel to the interrupting elements. The Hall effect switch is controlled by means of an exciter coil that is connected in parallel with the Hall-effect-active resistive elements to provide self excited operation. GRA

N85-21497 Department of the Air Force, Washington, D.C.
IMAGING APPARATUS FOR TRANSVERSE ELECTRODE ELECTRO-OPTIC TUNABLE FILTER Patent
R. L. Abrams, D. M. Henderson, D. A. Pinnow, and R. R. Stephens, inventors (to Air Force) Issued 22 Jan. 1985 5 p Supersedes AD-D009953 (AD-D011524; US-Patent-4,494,827; US-Patent-Appl-SN-435522; US-Patent-Class-350-385) Avail: US Patent and Trademark

Office CSCL 17/8

An imaging apparatus permits the use of a transverse electrode electro-optic tunable filter (TEOTF), despite its obscured aperture, to produce a high quality image. The imaging apparatus includes a suitable conventional anamorphic input optical system in combination with a stacked plurality of TEOTFs in which the platelet of each TEOTF is made of an electro-optic material of a known index of refraction (such as CdS of an index of approx. 2.4), and is clad between its surface and its electrodes with a material having a lower index of refraction than the platelet material (such as SiO2 of an index of approx. 1.5). GRA

N85-21498 Department of the Air Force, Washington, D.C.
PRINTED CIRCUIT BALUN WITH A DIPOLE ANTENNA Patent
M. W. Shields, inventor (to Air Force) Issued 22 Jan. 1985 4 p Supersedes AD-D010291
(AD-D011534; US-Patent-4,495,505; US-Patent-Appl-SN-493387; US-Patent-Class-343-821) Avail: US Patent and Trademark Office CSCL 09/5

A coplanar printed circuit beam is described for connecting an unbalanced feedline to a balanced dipole antenna. GRA

N85-21499 Department of the Navy, Washington, D. C.
COMBINED MICROWAVE PARALLEL AMPLIFIER-RF ATTENUATOR/MODULATOR Patent
M. L. Reuss, Jr., inventor (to Navy) Issued 16 Oct. 1984 6 p Supersedes AD-D010168
(AD-D011535; US-Patent-4,477,781; US-Patent-Appl-SN-467430; US-Patent-Class-330-286) Avail: US Patent and Trademark Office CSCL 09/5

A parallel channel microwave amplifier comprising a plurality of amplification channels interconnecting a power-dividing matrix and a power-combining matrix. Each amplification channel includes a phase shifter, an attenuator and a power amplifier connected in series. The device functions as a combination of amplifier and an RF attenuator/modulator. GRA

N85-21500 Department of the Air Force, Washington, D.C.
SAW OSCILLATOR WITH DIGITAL COMPENSATION FOR THE TEMPERATURE RELATED FREQUENCY CHANGES Patent
A. J. Slobodnik and R. D. Colvin, inventors (to Air Force) Issued 18 Dec. 1984 14 p Supersedes AD-D009497
(AD-D011537; US-Patent-4,489,289; US-Patent-Appl-SN-366746; US-Patent-Class-331-107) Avail: US Patent and Trademark Office CSCL 09/5

The inherent temperature instability of surface acoustic wave (SAW) clock oscillators is improved by the use of a thermometer oscillator circuit that senses temperature changes in the SAW substrate. The thermometer oscillator is used in combination with a calibrated programmable read only memory and a logic circuit and provides frequency corrections to the clock oscillator. The basic device is an oscillator clock circuit using a SAW substrate having a delay path orientation with good temperature stability. A second oscillator, the thermometer oscillator circuit, and the electronic compensation scheme are added in order to produce minimum temperature coefficient of delay over all temperatures in the range of interest. The thermometer oscillator delay path utilizes a high temperature coefficient of delay orientation of the same SAW substrate and at an appropriate angle to the clock oscillator delay path orientation. Its frequency of oscillation; is used as a highly accurate thermometer in order to control a correction signal applied to a variable phase shifter in the clock oscillator loop. GRA

N85-21501 Department of the Navy, Washington, D. C.
DIGITAL COHERENT DETECTOR Patent
W. M. Waters and B. R. Jarrett, inventors (to Navy) Issued 28 Aug. 1984 9 p Supersedes AD-D009282
(AD-D011560; US-Patent-4,468,794; US-Patent-Appl-SN-338396; US-Patent-Class-375-103) Avail: US Patent and Trademark Office CSCL 09/3

This invention relates generally to the field of coherent signal detection, and more particularly to a digital coherent detector for directly sampling and digitizing an IF signal. Objects of the present invention are: (1) to significantly increase the phase accuracy obtained in the coherent detection of a signal; (2) to eliminate the requirement for IF-to-baseband conversion in a coherent detector; and (3) to directly detect IF signals in a coherent detector. It is yet a further object of the present invention to significantly reduce the hardware and cost in implementing a digital coherent detector for IF. GRA

N85-21502 Department of the Air Force, Washington, D.C.
WIDE ANGLE PHASED ARRAY DOME LENS ANTENNA WITH A REFLECTION/TRANSMISSION SWITCH Patent
C. Rothenberg and N. Bellmore, inventors (to Air Force) Issued 1 Jan. 1985 7 p Supersedes AD-D010043
(AD-D011562; US-Patent-4,491,845; US-Patent-Appl-SN-444003; US-Patent-Class-343-754) Avail: US Patent and Trademark Office CSCL 09/5

An antenna assembly configured by the combination of the high forward gain of a conventional planar phased array antenna with the wide angle scanning capability of a dome antenna is described. The invention includes an optically fed phased array, which may be structurally configured similar to a conventional lens array, but comprises a reflection/transmission switch and an electronic phase shifter at each radiating element. The switches facilitate operation of the phased array in two distinct modes; when the switches are set for the transmission mode, the phased array operates substantially as a conventional lens array to scan a + or - 60 deg conical sector; when the switches are set for the reflection mode, the phased array behaves like a reflect array to scan an additional + or - 60 deg to + or - 20 deg sector. GRA

N85-21503# General Electric Co., Pittsfield, Mass.
STUDY OF ELECTRIC FIELD AND ION EFFECTS ON HVDC LINES Technical Progress Report
Gary B. Johnson Oct. 1984 156 p refs Sponsored in part by EPRI
(Contract DE-AC02-80RA-50153)
(DE85-002975; DOE/RA-50153/T1; TPR-7) Avail: NTIS HC A08/MF A01

Feasibility of conducting studies of HVDC electrical environment beyond the transmission corridor and of studying human perception of the electrical environment of high voltage transmission lines was investigated. Contract modifications contains the following tasks: (1) extend techniques of measurements of electric field, ion density, and net aerosol charge to off-ground positions; (2) develop measuring technique for the characterization of charged aerosols; (3) calibrate the instrumentation to measure charged aerosols; (4) measure the downwind lateral and vertical profiles of electric field, ion density, and net aersol charge density both at HVTRF and at the site of an operating HVDC line; (5) study the feasibility of measuring aerosol charging and wind transport in aerosol environments other than those normally present at HVTRF or existing HVDC lines; (6) check and validate mathetical methods of prediction of downwind charge for monopolar HVDC lines; and (7) support for research on human perception of fields and ions of ac and dc transmission lines. DOE

N85-21504# Magnavox Advanced Products and Systems Co., Torrance, Calif.
FUNDAMENTAL LIMITS TO SYNCHRONIZATION AND TRACKING Final Report, 30 Dec. 1982 - 30 Jun. 1984
C. R. Cahn, D. K. Leimer, L. S. Lin, and D. Prouty 30 Jul. 1984 202 p
(Contract N00019-83-C-0058; WR0-2101)
(AD-A149623; R-6679) Avail: NTIS HC A10/MF A01 CSCL 09/5

This is the Final Report for a study which was conducted over an 18 month period, and encompasses three tasks, as follows: Task 1 Acquisition Search: Establish fundamental limits to the rate of search for time/frequency acquisition, with particular application to high processing gain spread spectrum systems. The effects of phase noise and platform dynamics, such as Doppler rate of change due to acceleration, are to be studied. The potential

improvement offered by technologically advanced devices, e.g., matched filters, is to be examined. An objective is to show how matched filter processing gain may be trade for acquisition time; Task 2 Tracking for Coherent and Noncoherent Modulation: A comparison of coherent and noncoherent modulation techniques (BPSK versus MFSK, for example) is to be made with respect to tracking performance limits set by phase noise and platform dynamics. It is generally believed that noncoherent modulation is superior when phase noise effects are significant. However, this is offset by the inherent E sub b/N sub o advantage (approximately 3 dB) of coherent modulation schemes. The framework for the study is generic pseudonoise and frequency-hopping spread-spectrum antijam modulation and coding techniques; and Task 3 Combined Coding and Tracking, extends the delayed bit estimation algorithm for uncoded BPSK to a convolutionally encoded BPSK and QPSK signal. A comparison between noncoherent, differentially coherent, and partially coherent systems leads to the conclusion that partially coherent operation, sharing power between data and a pilot component, has approximately the same threshold and is a much simpler implementation than the delayed bit estimation algorithm. GRA

N85-21505# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
NICKEL-CADMIUM BATTERY CELL REVERSAL FROM RESISTIVE NETWORK EFFECTS
A. H. Zimmerman 17 Dec. 1984 26 p
(Contract F04701-83-C-0084)
(AD-A149626; TR-0084A(5945-01)-2; SD-TR-84-54) Avail: NTIS HC A03/MF A01 CSCL 10/3

During the individual cell short-down procedures often used for storing or reconditioning nickel-cadmium (Ni-Cd) batteries, it is possible for significant reversal of the lowest capacity cells to occur. The reversal is caused by the finite resistance of the common current-carrying leads in the resistive network that is generally used during short-down. A model is developed to evaluate the extent of such a reversal in any specific battery, and the model is verified by means of data from the short-down of a 4-cell, 3.5-A h battery. Computer simulations of short-down on a variety of battery configurations indicate the desirability of controlling capacity imbalances arising from cell configuration and battery management, limiting variability in the short-down resistors, minimizing lead resistances, and optimizing lead configurations. Author (GRA)

N85-21506# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF PLASMA PROCESSES IN ELECTRONIC TRANSITION LASERS Annual Report, 1 Jan. - 31 Dec. 1984
W. L. Nighan 15 Dec. 1984 36 p
(Contract N00014-76-C-0847; RR0-1107)
(AD-A149682; UTRC/R84-922617-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

United Technologies Research Center is conducting a theoretical investigation of the fundamental processes affecting the operation, performance and application of electrically excited lasers having potential utility in a variety of areas of importance to the Navy. Particular attention is presently focused on the broadband Xenon Fluoride (C yields A) laser, which has the potential for efficient, tunable operation throughout the blue-green spectral region. The research at UTRC is closely coordinated with a complementary ONR-supported experimental program being conducted at Rice University. This Annual Report summarizes recent results of this investigation, and includes reprints of recently published papers in which specific results and conclusions of the research are described in detail. Author (GRA)

N85-21507# Boeing Commercial Airplane Co., Seattle, Wash.
MAINTAINABILITY TIME STANDARDS FOR ELECTRONIC EQUIPMENT Final Technical Report
J. Rose, J. J. Voytko, and J. A. Davolt Jul. 1984 231 p
(Contract F30602-83-C-0019)
(AD-A149684; D6-52470; RADC-TR-84-165) Avail: NTIS HC A11/MF A01 CSCL 09/5

Data have been developed to enable predictions to be made of the time taken for the maintenance of electronic equipment. The data provided are universal and can be used for any type of electronic equipment and for any conditions that are representative of actual operating maintenance environments. All standards are derived from General Purpose Data, a system of elemental time standards for simple sequences of body motions. Four K factors have been provided to enable synthesized task times to be related to actual times. The K factors account for personal, fatigue, and delay allowances, for learning, for skill, and for the error between actual and predicted time (or variability). The contractor's experience with the application of a similar set of elemental standard times for mechanical system maintenance resulted in a high degree of consistency and accuracy. GRA

N85-21508# David Sarnoff Research Center, Princeton, N.J.
1.5 TO 1.7 MICROMETERS LEDS (LIGHT-EMITTING DIODE) Final Technical Report, 1 Jul. 1981 - 30 Jun. 1982
G. H. Olsen, D. J. Channin, D. Botez, R. E. Enstrom, and H. V. Kowger Sep. 1984 44 p
(Contract F19628-81-C-0013)
(AD-A149685; RADC-TR-84-181) Avail: NTIS HC A03/MF A01 CSCL 09/1

This report describes research undertaken to develop InGaAsP/InP Light Emitting Diodes (LEDs) that emit light in the 1.5 to 1.7 micrometer spectral regions. These devices were to be optimized for the best coupling to optical fibers and for high-speed operation. The double-barrel vapor-phase-epitaxy reactor was used to fabricate most of these devices. Both antireflective (AR) and six-layer dielectric-stack reflective (R) facet coatings were developed for 1.3 and 1.55 micrometer LEDs. Reflectivities as high as 95% (R) and as low as 3% (AR) were measured at both wavelengths. Measured coupled power from fiber-coupled InGaAsP/InP LEDs (50 micrometer core, 0.2 numerical aperature (NA), graded index (GI) fiber) includes values of 41 microwatts at 1.42 micrometers, 56 microwatts at 1.55 micrometers, and 11 microwatts at 1.65 micrometers. GRA

N85-21509# Centre National de la Recherche Scientifique, Besancon (France).
OSCILLATOR DEVELOPMENT Final Report, Aug. 1982 - Aug. 1983
J. J. Gagnepain, D. Hauden, and G. Theobald Griffiss AFB, N.Y. RADC Sep. 1984 49 p
(Grant AF-AFOSR-0318-82)
(AD-A149699; RADC-TR-84-180) Avail: NTIS HC A03/MF A01 CSCL 09/1

The objectives of this program are to: Evaluate the frequency instabilities of quartz crystal resonators as a function of temperature, Q-factors and power level, show the feasibility of low temperature quartz oscillators, and determine the dynamic thermal behavior of SAW quartz oscillators and determine crystal orientation and wave propagation directions with minimized sensitivities. GRA

N85-21510# Columbia Univ., New York. Dept. of Mechanical Engineering.
THE EIGENSTRUCTURE ASSIGNMENT OF DEADBEAT CONTROL SYSTEMS
G. Klein Dec. 1984 26 p
(Grant AF-AFOSR-0245-82)
(AD-A149761; AFOSR-84-1268TR) Avail: NTIS HC A03/MF A01 CSCL 09/3

All the available freedom in selecting the closed-loop Jordan block structure associated with deadbeat controllers is described and the parameters associated with this freedom are characterized. It is shown that in general one has freedom in selecting the Jordan block structure as well as the eigenvectors of deadbeat controllers. Although in general the feedback matrix is a nonlinear function of the eigenvectors that are assigned it is shown that for one important Jordan block structure the deadbeat controller feedback matrix is a linear function of the parameters of the system. The feedback matrix of minimum norm is then calculated for this special case. GRA

N85-21511# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
MONOLITHIC THIN FILM SAW (SURFACE ACOUSTIC WAVE) STRUCTURES Interim Scientific Report, 1 Jul. 1983 - 31 Aug. 1984
R. L. Gunshor, S. Datta, and R. F. Pierret 1 Sep. 1984 65 p
(Grant AF-AFOSR-0237-83)
(AD-A149782; AFOSR-84-1235TR) Avail: NTIS HC A04/MF A01 CSCL 09/5

A new storage correlator is presented. The characteristics are long storage and ease of fabrication. Very large Q values for SAW (on-silicon) resonators are reported. New device concepts involving AlGaAs-GaAs double heterostructures are proposed.
Author (GRA)

N85-21512# Illinois Univ., Urbana. Computer Systems Group.
CONCURRENT SIMULATION TECHNIQUES EXPLOITING HIERARCHY
W. A. Rogers Aug. 1984 61 p
(AD-A149783; CSG-34) Avail: NTIS HC A04/MF A01 CSCL 09/5

Current fault simulation techniques such as concurrent, deductive, and parallel fault simulation are not powerful enough for today's very large integrated circuit designs. More powerful fault simulation techniques are needed to prevent a crisis in integrated circuit testing. A new simulation technique based on the well-known concurrent and deductive techniques is presented, which uses a hierarchical representation of the circuit design and unlike the traditional implementations of these techniques does not expand the circuit to a single, lowest level, description. The simulation technique is shown to be decoupled from the fault model of the circuit through the use of fault libraries. These libraries are based on the principle that any detectable fault will cause an erroneous output value from some input vector. The implementation of this technique is described and preliminary performance results are given. The advantages and disadvantages of this technique are discussed and possible enhancements are described.
Author (GRA)

N85-21513# Illinois Univ., Urbana. Computer Systems Group.
DESIGN OF A BIT-SLICED PROCESSOR ARRAY WITH BUILT-IN-SELF-TEST
P. C. Mui Aug. 1984 83 p
(AD-A149785; CSG-31) Avail: NTIS HC A05/MF A01 CSCL 09/1

The overall objective of this report is to present an integrated approach to the design of bit-sliced processor arrays with built-in self-test. The conventional approach of making each bit-sliced processor chip self-testing is not used. Rather, a new approach of using an extra chip to test a processor array of any size and itself is used. The classical stuck-at fault model is not suitable for VLSI circuits. Rather, a functional level fault model is used. Each module of the processor array is tested exhaustively. The test responses of a fault-free processor array are made identical so that they can be easily monitored with no loss in fault coverage. The tester chip tests itself while it is testing the processor array. The fault coverages for both the tester chip and the processor array are high; the performance degradation is minimal; the area overhead is low, especially for large processor arrays; and the test length is short so tests can be performed more frequently. A VLSI design of the tester chip has been done with a 2-microns NMOS process.
Author (GRA)

N85-21514# Oak Ridge National Lab., Tenn.
BASIC STUDIES OF GASES FOR FAST SWITCHES Annual Summary Report, 1 Oct. 1983 - 30 Sep. 1984
L. G. Christophorou and S. R. Hunter Jan. 1985 93 p
(Contract N00014-82-F-0123; Grant DOE-42-0124-60-2)
(AD-A149828) Avail: NTIS HC A05/MF A01 CSCL 20/9

Desirable electron attachment and electron drift characteristics of gases for possible use in diffuse discharge switches are indicated. Gas mixtures for possible use in externally sustained (e-beam) diffuse discharge switches are suggested on the basis of electron attachment rate constants and electron drift velocities measured as a function of the density-normalized electric field E/N. Of particular promise are mixtures of Ar and C3F8. GRA

N85-21515# Westinghouse Research and Development Center, Pittsburgh, Pa.
FACTORS AFFECTING SOS (SILICON-ON-SAPPHIRE) YIELD AND RELIABILITY Final Report, 15 Apr. 1981 - 15 Apr. 1983
P. G. McMullin Griffiss AFB, N.Y. RADC Jul. 1984 184 p
(Contract F30602-81-C-0146)
(AD-A150004; Rept-83-6F4-FACTR-R1; RADC-TR-84-115) Avail: NTIS HC A09/MF A01 CSCL 09/1

This report describes methods for characterizing the quality of silicon-on-sapphire (SOS) wafers to improve the yield and reliability of integrated circuits fabrication in this material. Epilayer stress was measured by Raman lineshift. Epilayer surface haze was quantitatively measured by ultraviolet scattering. Epilayer defect densities were studied by XTEM. MOSFET transistors were fabricated in characterized wafers and electrically tested to determine yield. Device yields were very low in very high haze wafers with epilayers to determine yield. Device yields were very low in very high haze wafers with epilayers deliberately grown at suboptimal temperatures. There is no statistically significant correlation between haze or layer stress and yield for vendor wafers or for epilayers grown at nominally optimal temperatures. GRA

N85-21516# Miami Univ., Coral Gables, Fla. Dept. of Physics.
ELECTROMAGNETIC RAIL LAUNCHER AS A CIRCUIT ELEMENT Final Report, 1 Sep. 1983 - 31 Aug. 1984
Manual A. Huerta 25 Oct. 1984 24 p
(Grant AF-AFOSR-0338-83; AF Proj. 2301)
(AD-A150067; AFOSR-84-1140TR) Avail: NTIS HC A02/MF A01 CSCL 21/3

The circuit equations for the inductor driven rail launcher are integrated numerically using a fourth order Runge-Kutta method. Their solution is also obtained as a perturbation expansion for small resistance. The EMACK parameters are used to study the results. For high current shots the full numerical solution agress with the first order approximation to 3%. For low current shots they agree to 5%. A very simple zeroth order approximation agress with the full numerical solution to 5% in the high current case and to 3% in the low current case.
Author (GRA)

N85-21517# California Univ., Los Angeles. Lab. for Integrated Electromagnetics.
GAIN ENHANCEMENT METHODS FOR PRINTED CIRCUIT ANTENNAS
D. R. Jackson and N. G. Alexopoulos 28 Nov. 1984 47 p
(Contract DAAG29-83-K-0067)
(AD-A150090; UCLA-ENG-84-39; UCLA-15; ARO-19778.15-EL)
Avail: NTIS HC A03/MF A01 CSCL 09/5

Resonance conditions for a substrate-superstrate printed antennas geometry which allow for large antenna gain are presented. Asymptotic formulas for gain, beamwidth and bandwidth are presented and the bandwidth limitation of the method is discussed. The method is extended to produce narrow patterns about the horizon, and directive patterns at two different angles.
Author (GRA)

N85-21518# Pennsylvania Univ., Philadelphia. Dept. of Materials Science.
POLYMERIC ELECTROLYTES FOR AMBIENT TEMPERATURE LITHIUM BATTERIES Final Report
Gregory C. Farrington Aug. 1984 30 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001032; LBL-18288) Avail: NTIS HC A03/MF A01

Polyacetylene can be electrochemically oxidized in a cell of the type, Li/LiX in propylene carbonate/CH sub x, with nearly 100% coulombic efficiency for doping levels (y in [(ClO4) sub y] sub x), of less than 0.10. At higher values, the electrochemical potential of the oxidized film is above 3.9 V vs. Li/Li(+), and the electrolyte is unstable. Reduced polyacetylene (Li sub y CH) sub x can serve as an anode in a non-aqueous electrolyte is unstable.

Reduced polyacetylene (Li sub y CH) sub x can serve as an anode in a non-aqueous electrolyte battery in the traditional role of lithium. However, stable voltages and high coulombic efficiency for the reduction/oxidation process in an electrolyte of LiClO4 in tetrahydrofuran are only observed at reduction levels of < about 0.10. In addition, the potential of a polyacetylene anode doped with Li(+) is 0.5 to 1.5 V positive to that of Li in the same solution. At present, polyacetylene electrodes are rather unstable, sensitive to impurities, and characterized by low volumetric energy density, and low-moderate gravimetric energy density. They do not appear to offer major advantages for use in high energy density, rechargeable, non-aqueous electrochemical cells. DOE

N85-21519# Castle Technology Corp., Woburn, Mass.
SUPPORTED LIQUID MEMBRANE BATTERY SEPARATORS Final Report
J. Paul Pemsler and Michael D. Dempsey Jul. 1984 45 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001031; LBL-18287) Avail: NTIS HC A03/MF A01

The feasibility of using a supported liquid membrane (SLM) as a separator in the nickel-zinc battery was investigated. In particular, SLM separators should prevent zinc dendirte growth from shorting out the cell and might also alleviate capacity loss due to zinc electrode shape changes. A number of ion exchange/solvent modifier systems for incorporation into SLMs were developed under a previous LBL contract. SLMs prepared with hese reagents exhibited resistances in the range of 0.4 to 10 ohm sq cm, selectivity transported hydroxyl ions over zincate ions by a factor of 10 to the 6th power to 10 to the 7th power, and possessed electrochemical and chemical stability in alkaline electrolytes. In order to evaluate these SLM separators under conditions closely resembling a commercial Ni-Zn cell, an accelerated cycle life test was devised using commercial electrodes. DOE

N85-21520# Oak Ridge National Lab., Tenn.
PROGRAM PLAN FOR RESEARCH AND DEVELOPMENT OF DIELECTRIC MATERIALS FOR ELECTRIC POWER SYSTEMS
Oct. 1984 11 p
(Contract DE-AC05-84OR-21400)
(DE85-001327; DOE/OR-21400/3) Avail: NTIS HC A02/MF A01

This program is intended to further the fundamental understanding of dielectric materials, as well as to provide a data base for the development and application of these materials. Dielectric materials will be developed for future electric power equipment that will have improved efficiency and reliability. A comprehensive description of the DOE/EES R and D program for dielectric materials is given. The specific objectives of the program are: (1) to develop a fundamental understanding of the mechanisms occurring within dielectric materials and interfacial phenomena, (2) to develop dielectric materials and concepts and determine performance characteristics, and (3) to provide for technology transfer of materials and concepts for application by the electric power industry. Oak Ridge National Laboratory will assist the EES in managing the program. The R and D projects will be performed primarily by the private sector (industry and universities). DOE

N85-21521# California Univ., Livermore. Lawrence Livermore Lab.
NEUTRAL BEAM INJECTOR OXYGEN IMPURITY MEASUREMENTS AND CONCENTRATION REDUCTION VIA GETTERING PROCESSES
R. J. Kane, W. L. Hsu, R. G. Kerr, B. E. Mills, P. Poulsen, and S. Hibbs Oct. 1984 16 p refs Presented at the 31st Natl. Vaccum Symp., Reno, Nev., 3-7 Dec. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE85-000861; UCRI-91568; CONF-841218-2) Avail: NTIS HC A02/MF A01

The reduction of oxygen impurity levels by means of gettering within the arc chambers of the TMX-U neutral beam injectors was measured. The TMX-U Neutral Beam Test Stand was used for this experiment. Analysis incorporated silicon surface probes and optical Doppler-shift measurements of the Lyman alpha spectra of deuterium atoms with energies appropriate for D2O parentage. Without gettering, the Auger electron spectroscopy analysis of an exposed silicon sample showed a large oxygen peak below the surface peak with a concentration equivalent of approximately 2% for an accelerated beam. After gettering, with either titanium or chromium getters, the oxygen concentration was reduced by at least a factor of 10 according to optical monochromator data, and at least a factor of 8 from Auger spectroscopy data. Simultaneously, other metallic impurities were not increased substantially as a result of gettering. Additional effects observed include a change in the accelerated deuterium species concentrations, loss of gettering activity and arc operation, and a change in arc performance from arc chamber gas absorption during operation. DOE

N85-21522# Varian Associates, Palo Alto, Calif.
THE 60 GHz GYROTRON DEVELOPMENT PROGRAM Quarterly Report, Jan. - Mar. 1984
H. R. Jory, R. E. Bier, L. J. Craig, K. L. Felch, L. J. Fox, N. Lopez, H. E. Huey, J. Manca, and S. T. Spang 1984 29 p refs Prepared for ORNL
(Contract DE-AC05-84CE-21400)
(DE85-000599; ORNL-Sub-79-21453-19; QR-19) Avail: NTIS HC A03/MF A01

A microwave oscillator capsule of producing 200 kW of CW power at 60 GHz with high purity of the output mode is considered in the context of electron cyclotron resonanace heating of plasmas in controlled thermonuclear fusion experiments. Calculations using TAPER were done for mode conversion in an improved 4 inch diameter collector. The only remaining problem with the design is that it is slightly longer than previous CW collectors. Power density measurements were made on extended 2.5 inch diameter collectors using small diameter coils wound directly onto the collector to properly distribute the beam. The results were very encouraging for future CW operation of this design. Output window activity concentrated on improved surface finish, techniques of edge support, and initial design of a sapphire double disc window. DOE

N85-21523# Pinnacle Research Inst., Cupertino, Calif.
RESEARCH ON SEPARATORS FOR ALKALINE ZINC BATTERIES Final Report
Richard S. Yeo Berkeley, Calif. California Univ., LBL Oct. 1984 32 p refs Prepared in cooperation with RAI Research Co.
(Contract DE-AC03-76SF-00098)
(DE85-003082; LBL-18574) Avail: NTIS HC A03/MF A01

A hybrid separator as an improved battery separator in alkaline zinc secondary batteries with particular emphasis on mitigating the failure of zinc electrodes by controlling the permselectivity of the separator. Hybrid separators consist of a microporous film, radiation-grafted with a monomer containing ion-exchange groups and incorporate the favorable aspects of both ion-exchange membranes and microporous separators. Such hybrid separators should ideally be highly specific for fast transport of electrolyte while inhibiting zincate diffusion. Hybrid separators with a wide range of percent graft (0% to 60%) were made by varying the monomer concentration and radiation time. The grafting of these ionic groups imparts the ion selectivity of the separators. The electrolyte uptake of hybrid separators is ca. 60 wt %. The higher the percent graft of the separator, the higher the water uptake and the lower the KOH uptake that are observed. The permeabilities of zincate ions were measured for a series of hybrid separators. DOE

N85-21524# Fermi National Accelerator Lab., Batavia, Ill.
NEW PREAMPLIFIER FOR PARTICLE DETECTORS
R. J. Yarema Nov. 1984 26 p
(Contract DE-AC02-76CH-03000)
(DE85-004115; FNAL-TM-1284) Avail: NTIS HC A03/MF A01

A new preamplifier for particle detectors was designed and built. The device, designated MB43458, is a semi-custom monolithic assembled in a small, low mass package. The preliminary tests which have been done thus far are discussed. Tests are continuing to expand upon the results presented herein. DOE

N85-21525# EIC, Inc., Norwood, Mass.
RESEARCH TO EXPLORE THE FEASIBILITY OF SULFOLANES AS ELECTROLYTIC SOLVENTS FOR RECHARGEABLE LITHIUM BATTERIES Final Report
J. S. Foos, L. S. Rembetsy, and S. B. Brummer Sep. 1984 62 p refs
(Contract DE-AC03-76SF-00098)
(DE85-004345; LBL-18414) Avail: NTIS HC A04/MF A01

The possible use of sulfolane in Li batteries was investigated. The critical parameters were: the conductivity of sulfolane electrolytes, the stabillity of these electrolytes, and the ability of the electrolytes to cycle Li. Tests were conducted on pure sulfolane electrolytes and on sulfolane electrolytes containing co-solvents. DOE

N85-21526# Stanford Linear Accelerator Center, Calif.
UNIVERSAL FILE PROCESSING PROGRAM FOR FIELD PROGRAMMABLE INTEGRATED CIRCUITS
Dietrich R. Freytag and David J. Nelson Sep. 1984 4 p ref Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. - 2 Nov. 1984
(Contract DE-AC03-76SF-00515)
(DE85-004384; SU-SLAC-PUB-3454; CONF-841007-33) Avail: NTIS HC A02/MF A01

A computer program is presented that translates logic equations into promburner files (or the reverse) for programmable logic devices of various kinds, namely PROMs FPLAs, FPLSs and PALs. The program achieves flexibility through the use of a database containing detailed information about the devices to be programmed. New devices can thus be accommodated through simple extensions of the database. When writing logic equations, the user can define logic combinations of signals as new logic variables for use in subsequent equations. This procedure yields compact and transparent expressions for logic operations, thus reducing the chances for error. A logic simulation program is also provided so that an independent check of the design can be performed at the software level. DOE

N85-21527# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
DISTRIBUTED GUNN EFFECT DEVICES; A NUMERICAL ANALYSIS OF MICROSTRIP CIRCUITS ON THIN ACTIVE GaAs SUBSTRATES
Karin Lindholm and Staffan Rudner Dec. 1984 49 p refs In SWEDISH; ENGLISH summary
(FOA-C-30383-E; ISSN-0347-3708) Avail: NTIS HC A03/MF A01

The theoretical background for amplifying, and alternatively generating microwaves in microstrip type distributed Gunn effect devices with subcritical doping of the gallium arsenide substrate is presented. A computer program that from this theory gives various properties of the small signals from these microstrip circuits, e.g., gain and oscillator frequency as a function of doping, or bias is described. The program was used in a study of microstrip resonator oscillators. Author (ESA)

N85-21528# Mississippi Univ., University. Dept. of Electrical Engineering.
EVALUATION OF RESONANT MODES IN ISOLATED DIELECTRIC RESONATORS USING A SURFACE INTEGRAL EQUATION FORMULATION
J. Joseph Aug. 1984 77 p refs
(Grant NSF ECS-83-04442)
(PB85-110831; NSF/ECS-84001) Avail: NTIS HC A05/MF A01 CSCL 09A

The numerical procedure is presented for evaluation of the resonant frequencies, radiation Q factors, and modal field patterns of isolated dielectric resonators. The method is based on the solution of the scattering problem for a dielectric body of revolution, developed by Glisson and Wilton. A dielectric resonator can be modeled as a body of revolution. The natural resonances of this body of revolution are the homogeneous solutions of the method-of-moments matrix equation. To find the electromagnetic field distribution, the equivalent modal currents on the surface of the resonator are computed by a Gaussian elimination scheme. After the modal currents are found, the modal fields at any point in space are obtained by a vector summation of the contributions due to each of the current elements. The computer-generated field plots for several modes are presented. The resonant frequencies and the Q factors have been also measured by using the network analyzer. GRA

N85-21529# Commerce Dept., Washington, D.C.
PHASED ANTENNA ARRAY FOR WIND PROFILING APPLICATIONS Patent Application
David C. Hogg, inventor (to Dept. of Commerce) Filed Oct. 1984 25 p
(PB85-132884; US-Patent-Appl-SN-666594) Avail: NTIS HC A02/MF A01 CSCL 09E

The invention relates to a phased antenna array for use with radar apparatus for wind profiling based on Doppler frequency shift measurements. More specifically, the invention relates to a diagonally-shaped or diamond-shaped, phased array of individual antenna elements oriented to be uniformly polarized in a predetermined direction which is at a 45 degree angle to the principal planes of the array such that the radiation patterns are similar and geometrically tapered in the principal planes. GRA

N85-21530# Energy and Environmental Analysis, Inc., Arlington, Va.
COST COMPARISON OF SMALL GAS TURBINES VERSUS ELECTRIC MOTORS IN A VARIABLE LOAD INDUSTRIAL APPLICATION Progress Report, Aug. 1983 - Jul. 1984
T. M. Desai and S. Y. Salama Jul. 1984 106 p refs
(Contract GRI-5082-512-0622)
(PB85-149763; GRI-84/0156) Avail: NTIS HC A06/MF A01 CSCL 09C

Equipment such as pumps and blowers can save a substantial amount of energy when operated at part-loads with a variable speed drive in comparison to the conventional technology of using a constant speed drive and a throttle valve. Gas turbines and electrical motors, with and without variable frequency speed controller, for one such industrial application are compared. The application characteristics are developed after reviewing the published population data for motors and gas turbines. Two types of gas turbines, simple cycle and regenerative cycle, and three types of motors, standard, high efficiency, and high efficiency with variable frequency speed controller, are considered. The total life-cycle costs of these five prime movers are compared for three scenarios with varying extent of part-load operations. GRA

N85-21531# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING Abstracts Only
5 Mar. 1985 60 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-85-004) Avail: NTIS HC A04/MF A01

News items, abstracts and scientific reports on aspects of electronics and electrical engineering including sonics and ultrasonics; quantum electronics electro-optics; power engineering; communications; electromagnetic compatibility; computers; industrial electronics and control instrumentation; circuits and systems; acoustics speech and signal processing; aerospace and electronics systems; and broadcasting/consumer electronics. For individual titles, see N85-21532 through N85-21567.

N85-21532# Joint Publications Research Service, Arlington, Va.
TUBES AND TRANSISTORS IN AUDIO AMPLIFIERS Abstract Only
O. M. Reshetnikov, R. K. Khestanov, and Y. V. Chernykh *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 1 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 85-87 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The alleged differences between tube and transistor high-fidelity

sound reproduction channels, in terms of subjective versus objective evaluation of reception quality was studied. For testing the preamplifier stage behind the phonograph pickup was singled out, the Audio Research SP-6C tube preamplifier being compared with a specially built RIAA transistor preamplifier-corrector, so as to separate interaction of this stage from interaction of the output power stage with the acoustic part of the system. Tests were performed over a period of two months by the blind method, each test being performed twice using an A/B/X comparator: first in position A (tube) and B (transistor) only only and then also in position X for picking up randomized sound equiprobably identical to A sound and B sound, if those appeared different. According to expert listeners, there is no objective difference between tube and transistor preamplifier stages in terms of sound reception. The apparent difference was detected in only two tests not subsequently reproducible. Author

N85-21533# Joint Publications Research Service, Arlington, Va.
RADIOELECTRONICS AND SPACE EXPLORATION Abstract Only
T. Sarafanov, Y. Bogoroditskiy, and I. Milyukov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 2 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 11-13 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Citing the 23 years since Yuriy Gagarin's first radio transmission from outer space, the developments in radio communications and their role in mission control are summarized. Use of satellites for radio and television links with ground stations are an important part of information exchange. Construction and preventive maintenance activities by Soviet cosmonauts, use of radio technology for docking procedures and the reliability of such equipment, and the growing role of computer technology in space vehicles with human crews and pilotless craft are discussed. Automatic interplanetary vehicles that have landed on the moon, Mars and Venus, as well as artificial earth satellites, are facilitating weather and communication advances. Mock space equipment using radio and computer technology is of great importance for training cosmonauts. Despite all these practical applications, optimum utilization of automated equipment has yet to be achieved, and offers further challenge to Soviet and other engineers and technicians. Author

N85-21534# Joint Publications Research Service, Arlington, Va.
SATELLITE COMMUNICATIONS AND AMATEUR RADIO Abstract Only **c32**
A. Abolits *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 2-3 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 21-22 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Amateur radio use of Radio-1 and Radio-2 satellite communications is described since its beginning in October, 1978, which involves cooperation between DOSAAF and engineering and student design bodies. Second generation satellites Radio-3 and Radio-8 offered the possibility of an expanded system, and much work was done to increase useful life and reliability of space radio communications. Soviet and foreign radio amateurs currently make use of this equipment, and competitions via earth satellites were organized. Of special importance are communications for scholarly, educational and practical purposes with Arctic and Antarctic stations. Most amateur communication satellites are in low orbits, with the exception of the Phase-3 satellite of AMCAT. Commercial use and communications with remote areas with small populations are also discussed. Increased power and standardized design for wider uses are goals for development in coming years. Author

N85-21535# Joint Publications Research Service, Arlington, Va.
AUTOMATIC PICKUP OF TRAJECTORY BY METHOD OF SEQUENTIAL ANALYSIS TAKING INTO ACCOUNT DEVIATION OF RADAR MARKERS FROM CENTER OF STROBE Abstract Only **c32**
V. A. Kulikov and M. M. Sapov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 4 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 28-30 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Sequential analysis is considered as an alternative to logic gating for confirmation of pickup of target trajectories by radar. Two markers are used for confirmation, after decoding of all new markers picked up during the scan. A sequential detector tests to alternative hypotheses, about the target's presence or absence, respectively, with the likelihood ratio estimated on the asis of new markers hitting or missing the strobe (region of space within which anticipated appearance of new markers is liekly) on a given step of analysis. The main advantage of sequential detection is efficient elimination of suprious trajectories indicated by false markers appearing before secondary processing, but its drawback is protracted decision in the case of far targets and inevitable marker fluctiation. This drawback can be overcome by involvement of additional parameters in the detection process, most expediently the deviation of new markers from the center of the strobe (point within the strobe at which a given point of the target trajectory is anticipated). Author

N85-21536# Joint Publications Research Service, Arlington, Va.
PERFORMANCE RANGES OF HELICAL ANTENNA MADE OF CONDUCTOR WITH EXTRA BENDS Abstract Only **c32**
V. I. Demidchik *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 5 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 77-79 (For primary document see N85-21531 12-31)
Avail: NTIS HC A04/MF A01

The performance of a single-thread helical antenna with uniform lead angle alpha, made of a conductor bent into a meander with self-retardation determined by its height-to-period ratio, was theoretically analyzed with experimental verification. Calculating the characteristics of such an axial-beam antenna requires solution of the Pocklington integral equation by numerical methods for the current distribution and its dependence on the k alpha parameter (k- wave number, alpha - radius of helix). The performance ranges of such an antenna are determined by the ellipticity factor in the (k alpha, alpha)-plane, which depends on the meander height and height-to-period ratio. The performance characteristics of double-thread and multithread helical antennas are similar, addition of threads resulting in a wider range of axial beaming with respect to directive gain and polarization. Experimental data confirm the theoretical results, minor differences being attributable to inaccurate evaluation of the ellipticity factor and to finiteness of the screen dimensions. Author

N85-21537# Joint Publications Research Service, Arlington, Va.
OPERATING TIME METER FOR TAPE RECORDER Abstract Only **c35**
M. Ganzburg and O. Dyuffel *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 6 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 38-40 (For primary document see N85-21531 12-31)
Avail: NTIS HC A04/MF A01

As an alternative to standard tape counters for popular tape recorders, a photo-electric device for measuring operating time so as to give a precise reading of expended and available operating time. The device consists of two optical components in a slotted cylinder attached to the rubberized free-wheeling tension wheel. The first, third and fourth discharge circuits have a calculation coefficient of 10, the second, of 6. Technical features are diagrammed and described. The three components include the mechanical tension wheel and the plate on which the light- and photodiodes are mounted, the basic meter plate and light diode indicators and related components. If quality parts are properly mounted, no calibration is required. Features of mechanical tape regulation permitting smooth monitoring of tape movement may make the photoelectric device described unnecessary. Author

N85-21538# Joint Publications Research Service, Arlington, Va.
QUARTZ FILTER TRANSCEIVER Abstract Only

Yakov Semenovich Lapovok *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 6 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 24-27 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The latest transceiver produced by prize-winning designer is discussed. The transceiver described operates at 1, 3.5, 7, 14, 21 and 28 Mgh in CW and SSB modes, with a single frequency transformer and intermediate frequency of 8815 Khz provided by a commercially produced quartz filter. Dynamic range of 120 Db, signal measurements from S4 to S9+20 Db or +50 Db with input attenuator and independent frequency selection are some of the transceiver's features. Circuitry is diagrammed and explained, with further explanations promised in a subsequent issue. Author

N85-21539# Joint Publications Research Service, Arlington, Va.
SUMMATOR OF RADIO PULSE SIGNALS Abstract Only c32
V. S. Mostyko and K. V. Ivanov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 10 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 83-85 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A high-quality summator of radio-frequency pulse signals was built for intermediate-frequency stages in radar receivers, particularly in channels where phase-keyed quasi-noise signals appearing with noise interference are processed. The summing circuit is connected on the input side to a commutator and is followed by a band-pass output amplifier. The commutator, containing 8 pairs of independently driven transistor switches, receives signals from a band-pass input amplifier through an 8-tap delay line and from a code generator through a control circuit. The prototype of this summator was tested and found to produce output signals with sufficiently small deviations of phase shifts upon cophasal cummation of antiphasal summation as well as sufficiently small amplitude nonuniformity of the order of a few percent only, the latter being achieved by inclusion of trimmers in the commutator or in the summing circuit. The summator is suitable for a 50 MHz tuning range, its delay line being designed for radio signals of 8 tau (tau = 1.6 microns) duration. Author

N85-21540# Joint Publications Research Service, Arlington, Va.
HIGH-FREQUENCY INPUT DEVICE FOR SUPERHETERODYNE RADIO RECEIVER WITH WIDEBAND PRESELECTOR Abstract Only c32
S. M. Sarayev *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 11 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 37-40 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

An input device for a superheterodyne radio receiver with a wideband preselector and an array of switchable different band-pass filters is described. The device ensures high channel selectivity as well as adequate sensitivity at all combination frequencies during step-down frequency conversion. The performance of this input stage is evaluated in terms of frequency mismatches between the preselector filters and the symmetric mixer channel, these mismatches depending on the nonsquareness of the amplitude-frequency characteristics of the filters. Calculations for a 4-octave receiver with a 16-channel preselector indicate that the number of filters needed for covering the entire frequency range can be minimized by use of filters with bandwidth as well as upper and lower frequency limits appropriately chosen relative to the intermediate frequency. An additional frequency conversion in the upper half of the frequency range will further reduce the needed number of filters. The increased selectivity of the high-frequency input device will also increase the immunity to intermodulation and second-harmonic combination-frequency interference. M.G.

N85-21541# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF ORTIMUM RECEIVER AND PROCESSOR FOR SIGNAL PACKET OF RADIO PULSES Abstract Only c32
A. L. Ryabtsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 11-12 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 21-24 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A quasi-coherent optimum receiver and processor for a useful signal packet of radio pulses appearing in an additive mixture with a stationary normal white noise is synthesized in accordance with the Markov theory of nonlinear filtration. In addition to a period estimator, multipliers, a differentiator, and a summator, the structure of this device includes a shaper of unit-amplitude video pulse packets, a fine-tunable carrier-frequency oscillator, and a (O, pi) phase keyer. The estimated error of period parameter filtration indicates that a packet of L radio pulses has a signal to noise ratio L times higher than a single pulse. In the extreme case of zero filtration error and a payoff of using pulse packets (M approaches the square root of L) the a-posteriori dispersion of the filtered period parameter is the square root of L times smaller in a packet than in a single radio pulse. M.G.

N85-21542# Joint Publications Research Service, Arlington, Va.
DEVICE FOR CONTROLLING OPERATION OF LITHICON CATHODE-RAY MEMORY TUBE Abstract Only
I. A. Smirnova *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 13 Transl. into ENGLISH from Tekhnika Kino i Televideniya (USSR), no. 10, Oct. 1984 p 51-52 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Cathode-ray memory tubes, lithicons, were developed which record television frames on the target surface with adequate quality for broadcasting without spontaneous erasure of the potential profile after turn-off or during lengthy storage. A device for controlling the operation of a lithicon was subsequently developed which ensures application of the proper voltages to three tube components (modulator, signal plate, erasing electrode) during three stages of the operating cycle (preparation for recording, recording, readout with normal erasure) and storage. The device consists, accordingly, of three arrays of four voltage generators each and one array of control-pulse generators. Better control of analog devices such as memory tubes will ensure their competitiveness against digital devices. Author

N85-21543# Joint Publications Research Service, Arlington, Va.
ESTIMATING ALGORITHMIC ERROR OF DIGITAL RECURSIVE FILTERS Abstract Only
Vladimir Yuryevich Kirillov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 15 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 65-68 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The algorithmic error in the output signal of a digital recursive filter synthesized on the basis of an analog prototype filter is estimated, considering that this error is caused by time discretization only and assuming that the discretization interval is known. The filter is treated as a linear system operating in the pulse mode and the effect of level quantization on the algorithm is disregarded. Analysis and calculations on this basis yield the maximum difference between the steady-state values of the output signal of such a filter and the discrete values of the output signal of an ideal analog filter, this difference being obtained from the particular solution to the differential equation of the filter. For a typical filter with the transfer function (H(z) = KT [1 (e to the -l/IL sub z-1-1] and an input signal u (tau) = sin (omega tau) this error is 0.0516 when ll-2s, K=2, T=0.1s, omega=1 rad/s, max u' (tau) = 1. Author

N85-21544# Joint Publications Research Service, Arlington, Va.
WIDEBAND PHASE KEYERS Abstract Only
V. I. Gvozdev, M. Y. Litvinenko, and V. B. Sedletskiy *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 15-16 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 82-83 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A wideband 0 to P1 phase keyer has been developed on the basis of a hybrid ring bridge formed by a half-wavelength symmetric slot line, with an incoming straight symmetric slot line and an outgoing asymmetric strip line connected at diametrally opposite points. The advantages of this device over a conventional one on the basis of a magic tee with an open loop formed by a quarter-wavelength asymmetric strip line are that diodes can be connected directly without matching devices and that a frequency-independent 180 deg phase shift occurs within the input tee. An experimental prototype of this new phase keyer was built on a 1-mm thick Polikor substrate with GaAs Schottky-barrier diodes. It was subsequently tested with a modulating 10 MHz meander signal. The results were a carrier attenuation of at least 30 dB over the entire 1.6 to 2.8 GHz range, with the loss of parasitic frequency conversion less than 7 dB per sideband and loss on the parasitic amplitude modulation not more than 0.3 dB, holding the nonuniformity of the amplitude-frequency characteristic below 2 dB. G.L.C.

N85-21545# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF DIGITAL NONRECURSIVE BAND-ELIMINATION FILTERS FOR MOVING-TARGET SELECTORS Abstract Only
I. A. Kozlov and T. V. Mironova *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 16 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 41-44 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A synthesis of digital nonrecursive optimum Chebyshev band-elimination filters is shown, such filters of low order (n < or = 4) being the simplest and thus most suitable for moving-target selection. They have an antisymmetric pulse response characteristic and a linear phase-frequency characteristic, their amplitude-frequency characteristic containing several equally large ripples in the stop band and one ripple in the pass band. The synthesis is based on a trigonometric polynomial derivable from an algebraic power polynomial by change of variables; sin (1/2 omega tau) becomes x. Such a filter can be designed for not less than the necessary attenuation in the stop band or for more than the allowable nonuniformity of the pass band. A filter of higher order becomes feasible upon widening the pass band so as that it will contain two or more ripples. This is demonstrated by the synthesis and design of a sixth-order filter in this class. Author

N85-21546# Joint Publications Research Service, Arlington, Va.
METHOD OF DESIGNING DIGITAL BAND-PASS FILTERS WITH INFINITE MEMORY Abstract Only
V. V. Vityazev, S. I. Muravyev, and A. I. Stepashkin *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 17 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 8-13 Original language document announced as 85A-15766 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A digital band-pass filter with infinite pulse response characteristic H(omega) is proposed which consists of a digital comb filter with a frequency characteristic H sub 1 (omega)=H(omega) periodic sequence of side lobes and a digital smoothing filter with a frequency characteristic H sub 2 (omega) behind, the latter extracting the main lobe from the spectrum. The major problem of designing the comb filter with the necessary selectivity is treated as one of synthezing some basal low-frequency filter by the Kaiser method. Both synthesis and subsequent performance analysis are demonstrated on a Butterworth filter with 3 dB attenuation at 10 Hz and at least 40 dB attenuation at 20 Hz, for discretization of input signals at a 10 kHz frequency. Author

N85-21547# Joint Publications Research Service, Arlington, Va.
OPTIMAL THRESHOLD AND WEIGHT SORTING OF ELEVATION ANGLE READINGS UNDER CONDITIONS OF FADEOUTS OF A DIRECTED SIGNAL Abstract Only **c32**
V. V. Perkov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 22 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 24-28 Original language document announced as 85A-15764 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A determination is made of the optimal threshold and weight function in the threshold and weight reception of a signal in a direction-finding system. The gain due to optimal weight processing prior to optimal threshold sorting is calculated. G.L.C.

N85-21548# Joint Publications Research Service, Arlington, Va.
MULTICHANNEL DIGITAL PROCESSING OF WIDEBAND SIGNALS Abstract Only **c32**
M. M. Milykh and V. F. Struchev *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 22-23 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 3-8 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The feasibility of processing wideband signals by discretization with high speed narrow band converters is examined, conventional analog to digital converters not being suitable for processing signals more than 20 MHz wide. Subdividing the entire frequency range into N narrow channels is proposed as an alternative, with discretization in each channel to be followed by reconstruction of signal readings from readings in all those channels. For illustration, the signal is assumed to have a finite spectrum. Narrow channels are formed by means of quadrature conversion at the corresponding center frequencies with the aid of low-pass filters, whereupon analog to digital conversion is performed at the discretization frequency. The amplitude-frequency charactristics of these filters are trimmed and matched by means of a discrete Fourier transformation with the use of apertures such as Hemming or Kaiser apertures. The output signals from the filter array are subsequently processed by conventional two-dimensional methods for one-dimensional sequences. Author

N85-21549# Joint Publications Research Service, Arlington, Va.
DIGITAL DETECTOR OF HARMONIC SIGNALS Abstract Only
L. M. Goldenberg, B. D. Matyushkin, and M. N. Polyak *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 23 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 61-63 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A detector of harmonic signals is synthesized with an array of digital filters; harmonic signals at p definite different frequencies among possible ones being sent through a communication channel over some period of time delta for service purposes. Each filter is followed by a threshold device deciding about the presence or absence of a sinusoidal signal. An array of two filters is considered for detection of signal sin (n omega sub i T + phi) = sin(phi)cos(n omega sub i T) (phi-a priori unknown phase, t-discretization interval, (N-1)T-length of filtration interval, n= delta/T-number of input signal reading, i=1,2 referring to the threshold devices), with filter 1 matched to signall cos(n omega sub i T) and filter 2 matched to signal sin(n omega sub i T). The performance of this detector is evaluated, by simulation of the pulse response characteristics and the transfer functions of both filters, for n=N-1 and the smallest N possible which will satisfy the equality omega sub i NT = 2 pi r sub i (r sub i -some integer). The detector is found to allow for some variations of amplitude and frequency in the input signal. M.G.

N85-21550# Joint Publications Research Service, Arlington, Va.
OPTIMAL DISCRETE FILTRATION OF INTRICATE PHASE-KEYED SIGNALS Abstract Only **c32**
G. I. Tuzov, V. V. Gorshkov, and S. A. Rubtsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 24 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 55-58 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

An optimum discrete filter for arbitrarily intricate phase-keyed signals is synthesized assuming that such signals arrive at the receiver in an additive mixture with Gaussian white noise. While both phase angle theta(t) and time delay (t) are described by stochastic equations, d theta/dt = omega - omega sub 0 and d

tau/dt = v - sub 0 (t-time, omega sub 0-a constant frequency, v sub -a constant rate of change of time delay), the state vector X(t) is estimated from the a-priori probabilistic equation X(t)=FX(t) + GW(t) (F-state matrix, G-perturbation matrix, W sup T (t)-noise vector). The equations of optimal continuously discrete filtration are derived on the basis of the Markov nonliner filtration theory, whereupon the covariational error matrix is calculated. The accuracy and the intererence immunity of the corresponding processor structure under static and dynamic conditions depend, accordingly, on the behavior of the error matrix elements in time. The steady-state interference immunity of such an optimum discrete receiver is somewhat lower than that of the corresponding optimum analog one, the discretization process playing the major role in lowering it. M.G.

N85-21551# Joint Publications Research Service, Arlington, Va.
ADAPTIVE REGULATION OF TRANSMITTER RADIATION POWER IN RADIO LINES DURING DELAYS OF CONTROL SIGNALS Abstract Only c32
A. G. Onyshko and V. P. Postyushkov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 24 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 36-37 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Adaptive power regulation is considered for transmitters in radio lines with signal fadeout. This requires availability of some extra power margin for compensating the decrease of reliability caused by delays of control signals. The algorithm for optimizing adaptive power regulation so as to ensure required reliability with minimum energy loss, or maximum efficiency with no decrease of reliability, is shown for a typical communication channel with log normal distribution of the transmission coefficient. M.G.

N85-21552# Joint Publications Research Service, Arlington, Va.
SIMULATION OF THERMAL AND ELECTROMAGNETIC PROCESSES IN INDUCTION PLASMATRONS Abstract Only c75
Boris Sergeyevich Polevodov, Viktor Boleslavovich Demidovich, and Yuriy Alekseyevich Skvortsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 27 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 13-21 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

In the most general model of a plasma its kinetic description is based on statistics of a multiparticle system, which can be treated as a liquid with temperature-dependent thermal conductivity, electrical conductivity, and viscosity. The flow of such a liquid in an induction plasmatron is described accordingly, in the approximation of an equilibrium plasma. Simulation of the plasmatron performance involves calculation of the heat and mass transfer, heat sources and ponderomotive forces being obtained from the solution to the corresponding Maxwell equations, and calculation of the electromagnetic field. The electromagnetic problem can be solved by two basic methods, taking into consideration that the intricate current density distribution and the nonstationary boundaries of the conduction region are not a priori known. The first method is based on long-range action and Ampere's law. The corresponding Fredholm integral equations of the second kind need to be solved for the conduction region only. The second method is based on short-range action and mathematical description by a second-order differential equation, solvable by the algorithm of finite differences. Both methods have been combined so that the advantage of each is utilized in the proper sequence. M.G.

N85-21553# Joint Publications Research Service, Arlington, Va.
REDUCING ELECTRIC POWER LOSSES IN DISCHARGE CHAMBER OF INDUCTION PLASMATRON Abstract Only c75
Viktor Ivanovich Borisenkov, Sergey Vyacheslavovich Dresvin, and Lev Aleksandrovich Kuzmin *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 28 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 21-27 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The main advantage of induction plasmatrons is the absence of electrode erosion products in the cold plasma, but their drawback is a high Joule-effect power loss in the metal wall of the discharging chamber. An experimental study of this power loss was made, therefore, for the purpose of finding ways to reduce it. The cylindrical wall was segmented into eight identical longitudinal panels of four different constructions: (1) hollow (duct) all-copper; (2) hollow (duct) copper slit lengthwise on the outside for insertion of a dielectric strip; (3) solid (plate) all-copper; and (4) solid (plate) made of 12Kh18N10T stainless steel. Calorimetric measurements were made in the frequency range of rotating alternators and thyristor converters. Calculations were made on the basis of the electromagnetic models representing each kind of wall pane' The results of measurements and calculations agree fairly wel and indicate that at 8 kHz splitting the copper decreases the power loss to about half and replacing copper plate with steel plate of the same thickness decreases the power loss to about one sixth. The steel plate can be made much thinner, however, so that a decrease of power loss by a factor of at least 26 and up to 300 become feasible for 5 to 10 MW plasmatrons with discharge chambers operating at 2 to 10 kHz. M.G.

N85-21554# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF MULTIARC PLASMA DEVICES Abstract Only c75
Valeriy Stepanovich Klubnikin and Benedikt Girgoryevich Smirnov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 29 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 27-33 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Multiarc plasma devices such as plasmatrons operate with lower arc currents than single-arc counterparts, which not contributes to a higher efficiency but also extends the life of electrodes. Typically, reduction of the arc current for producing an air plasma from 400 A to 100 A or further to 50 A lengthens the life of zirconium electrodes from 24 h to 400 h and 1600 h, respectively. The electric arcs can be connected in series or in parallel. A series connection features high arching stability but requires special mixing chambers for prevention of mutual arc shunting. A parallel connection eliminates this drawback but limits the arcing stability, the latter decreasing as the number of arcs in parallel increases. A third possibility is a multiarc device with separate voltage supplies and a single common control system. The performance of any multiarc plasma device is determined by its current-voltage characteristic. For determining the optimum operating mode, not only the dependence of the arc voltage on the arc current but also its dependence on the arc length, the channel diameter, the gas flow rate, and the gas pressure were evaluated. Calculations are based on semiempirical and dimensional analysis of experimental data from about 200 measurements over wide ranges of variable parameters for discharge in argon. Author

N85-21555# Joint Publications Research Service, Arlington, Va.
COMPUTER SIMULATION OF EQUIPMENT AND PROCESSES INVOLVED IN HIGH-FREQUENCY HEATING OF DIELECTRICS Abstract Only
Feliks Visilyevich Bezmenov, Sergey Grigoryevich Gurevich, and Natalya Davyovna Dekster *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 30 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 38-46 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Computer software for simulation of high-frequency electric heating of dielectric materials was developed. The software consists of several program modules for process analysis, equipment design and performance calculations, as well as different modules for different types of heating processes in different applications. In a short-duration heating process, the electrostatic or electromagnetic field determines the heat sources and the latter determines the temperature field. In the case of a long-duration

heating process it is necessary to solve both the electrical problem and the thermal problem. The electric field is calculated from the equation of the potential field or from the system of Maxwell field equations, depending on the ratio of wavelength to capacitor dimension. The equation of the potential field is solved by the method of finite differences for simple configurations or by the method of finite elements for intricate configurations, the latter method being equivalent to minimization of the field functional in the variational form of the problem. The equations of one- or two-dimensional wave fields are solved by direct methods. R.J.F.

N85-21556# Joint Publications Research Service, Arlington, Va.
TRANSISTOR-TRANSISTOR LOGIC MICROCIRCUIT TESTER Abstract Only
Y. Zaltsman *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 32 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 45-46 (For primary document see N85-21531 12-33)
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Digital microcircuits currently in use need to be tested before final installation. A tester consisting of a control code former and comparison and indication devices is discussed. The importance of limiting the duration of load on the HL1 light diode to prevent burn-out is stressed. With a frequency coefficient of 1024, all states are indexed about 1000 times per second. Technical features of the tester are diagrammed and described. Correct switch-on of microcircuits and the variety of applications for the testers to a number of microcircuits with varying input and output set-ups are summarized. R.J.F.

N85-21557# Joint Publications Research Service, Arlington, Va.
REDUNDANCY OF CODES FOR DETECTION AND CORRECTION OF UNIDIRECTIONAL ERRORS Abstract Only c61
G. A. Borodin, A. K. Stolyarov, and V. A. Ivanov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 33 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 63-65 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

The necessary redundancy of codes for detection and correction of errors in programmable modular semiconductor-microcircuit memories is evaluated in terms of the lower bound for the number of control digits in such a code. Considering that all errors of failure in such a memory are unidirectional, its cells switching together either to the '0' state or to the '1' state, this redundancy analysis is based on two theorems pertaining to the error detection and correction capability of a code depending on properties such as disorderedness of any of its component word-vector pair. With the aid of these two theorems, six other ones are validated which pertain to the buildup of a word-vector pair and to the number of control digits a code must contain, depending on the word-vector length and on the error length.
Author

N85-21558# Joint Publications Research Service, Arlington, Va.
PROGRAM FOR CONTROLLING ELECTRICAL MEASURING CONTACT INSTRUMENT ON GLOW-DISCHARGE INDICATOR PANEL Abstract Only
V. N. Stepanov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 33-34 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 70-71 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A program to be entered in the read-only memory of a microprocessor is now available for controlling the display of alphanumeric and symbolic data on a panel consisting of 8x5 IMG-3-01 indicator modules. The microprocessor must have the capability to receive data in the MTK-2 sequential code and in the KOI-7 parallel code, typically from a telegraph set and from a computer terminal, respectively, to store data coming from each in separate buffers of the direct-access memory, and to display as well as to erase them. The program includes five subroutines: (1) processing of interrupts from telegraph OPRTA and from computer terminal OPRAP; (2) control subroutine; (3) display of memory contents from buffer assigned to telegraph OTTA and from buffer assigned to computer terminal OTAP; (4) clearing of contents from either buffer SBTA and SBAP; (5) clearing the display panel. The program occupies 1814 bytes in the read-only memory and 6320 bytes in the direct-access memory. Author

N85-21559# Joint Publications Research Service, Arlington, Va.
DETERMINING DISTRIBUTION OF COMPLEX DIELECTRIC PERMITTIVITY OVER CYLINDRICAL BODY OF INTRICATE CROSS SECTION FROM ELECTROMAGNETIC FIELD MEASUREMENT Abstract Only c32
Ivan Petrovich Stadnik, Irina Yuryevna Gorskaya, and Sergey Pavlovich Kulikov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 35 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 15-20 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A long cylinder of any given intricate cross section, with a dielectric permittivity and an electrical conductivity independent of the axial coordinate, is placed in the electromagnetic field of a monochromatic wave with the generatrix parallel to the electric field vector. The distribution of dielectric permittivity over cross sections of this cylinder is calculated from readings of the field components at points within a cross section. The first step of the algorithm is calculating the axial component of current density as the sum of density of the conduction current and the axial component of the polarization vector, the latter multiplied by the frequency. The second step of the algorithm is calculating the resultant internal electric field as the sum of the primary electric field and the electric field induced by the cylinder current of already known density. The third and last step of the algorithm is calculating the dielectric permittivity at any given point from the already known current density and the primary electric field. R.J.F.

N85-21560# Joint Publications Research Service, Arlington, Va.
ALGORITHM FOR STATISTICAL SIMULATION OF ELECTROMAGNETIC COMPATIBILITY CHARACTERISTICS OF HIGH-FREQUENCY TRANSMISSION CHANNELS IN RADIOELECTRONIC FACILITIES Abstract Only c32
Y. M. Ilin and S. V. Mints *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 36 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 33-35 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Considering that electromagnetic compatibility of radioelectronic equipment and its dependence on the compatibility of individual components are important criteria for the design and optimization of high-frequency transmission channels as well as for selecting their mode of operation, a statistical mathematical model is proposed for describing the spectral characteristics of such channels. This model assumes linear interaction of incoming parasitic signal components with the useful signal component in a nonlinear input amplifier. it also assumes that the spectral characteritics of individual equipment components are noncorrelated. The algorithm of statistical simulation and subsequent optimization on this basis consists of four successive steps: (1) analysis of equipment performance requirements; (2) structural synthesis of channel and particularization of its mocrowave components; (3) analysis of channel structure; (4) analysis of a statistical model, followed by optimization of channel components including microwave devices. R.J.F.

N85-21561# Joint Publications Research Service, Arlington, Va.
CONTROL OF NONLINEAR OBJECTS Abstract Only c63
Oleg Pavlovich Ilin and Petr Pavlovich Primshits *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 37 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Electromekhanika (USSR), no. 10, Oct. 1984 p 68-73 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A method is proposed which synthesizes automatic control for nonlinear objects and has more dynamic characteristics than

the Lyapunov's second method and which reduces the object to an asymptotically stable one. A mathematical model is considered which describes a nonlinear object by nonlinear equations of state. The necessary dynamic performance will be ensured by a linear system described by the normalized equations of state. Synthesis of the control invoies finding the equation U=U(X,A,C,B,U sub O) which will make the nonlinear system behave like the linear one. This requires compensation for the components of the control act at various points of the object and that of the effect of negative feedback, except at the first point. Nonlinearity composition can then be added to the main control and the feedback compensation. The algorithm of this method of synthesis is verified by computer simulation. E.A.K.

N85-21562# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF DIGITAL CONTROL FOR OBJECT WITH LAG Abstract Only **c63**
Vitality Yakovlevich rotach and Anatoliy Romanovich Gayduk *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 38 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 58-64 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

An algorithm of microprocessor-aided digital control is constructed for a linear object with lag. It is assumed that the object is continuous, thus comprising a pulse filter, its interaction with the control device occurring through appropriate analog-to-code and code-to analog converters. The corresponding equation of state and action in discrete Laplace transforms is solved for zero initial conditions, upon its conversion to a different equation with all constant numerical polynomial coefficients evaluated and the numbers of coefficients established in the synthesis process. A theorum pertaining to the conditions for existence and uniqueness of a solution is formulated, and proved, in terms of two bounds for number of coefficients in the denominator and the numerator relative to the order of the open-loop system and mu sub O. The order of the closed-loop system is established on this basis, as are relations necessary for obtaining the desired response characteristic. E.A.K.

N85-21563# Joint Publications Research Service, Arlington, Va.
MAGNETIC FIELD IN MAIN GAP OF SEPARATOR Abstract Only **c70**
Vaginak Onikovich Kartashyan, Vladimir Ivanovich Fadeyev, and Aleksandr Nikolayevich Spivak *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 39 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 20-23 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

High magnetic flux density in the main gap of a metallurgical separator is achieved by shunting the active zone with a ferromagnetic chute, a specially profiled pole pieces producing the necessary non-uniformity of the magnetic field in that gap. One symmetric pole tooth is singled out for calculations, and all pole pieces are assumed to be saturated so that the magnetic permeability of the steel can be taken as mu-infinity. The boundary conditions are zero flux gradient under the pole tip at the center, where the gap is narrowest, and zero tangential field intensity component at the steel-air interface. Calculations are made by the method of conformal mapping, with use of the Schwarz-Christoffel transformation, and subsequent evaluation of the corresponding Euler (beta function) integrals. It is found that the results of this theoretical procedure agree within 7% with a physical model. E.A.K.

N85-21564# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF SMALL FERROMAGNETIC PARTICLES IN TRAVELING MAGNETIC FIELD Abstract Only **c70**
Vladimir Genrikhovich Deych and Vladimir Pavlovich Terekhov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 39-40 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 23-26 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Forces and moments acting on a magnetizable body in a traveling magnetic field are calculated for a body with dimensions much smaller than the wavelength of the magnetic field. It is assumed that a particle of given linear dimension does not have a constant magnetic moment. The material of a particle is characterized by its magnetic permeability and electrical conductivity. The hypothesis that rotation plays a major role in the behavior of small particles is confirmed and the fact that a small particle rolls on a plane, without sliding, when the surface is perfectly rough, in the opposite direction from which the magnetic field travels is explained. Calculations are based on the magnetohydrodynamic equations for a quasi steady magnetic field, and the induced Foucault eddy currents are considered. The results are applicable to transport of ferrofluids and to such metallurgical devices as separators. E.A.K.

N85-21565# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL SIMULATION OF THERMAL PRROCESSES INVOLVED IN ELECTRON-BEAM TREATMENT Abstract Only **c72**
Vitaliy Grigoryevich Boltin, Lev Vitalyevich Peysakhovich, and Aleksandr Vasilyevich Shpagin *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 46 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 103-106 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Electron-beam welding specifically the performance required of the beam accelerating voltage is considered. The analysis is based on the temperature field, with the three-dimensional quasilinear Fourier equation of transient heat conduction in a moving medium replaced by a two-dimensional one applicable to thin strips and sheets. The mathematical model for calculations refers to a rectangular steel strip to be heated by a surface source representing the spot struck by the electron beam, assuming a Gaussian current distribution over the beam cross section and a corresponding kind of heat source. The dependence of the temperature field on the ripple frequency of the accelerating voltage is determined. The melting temperature is introduced as a singular point into the algorithm. These calculations yield the ripple factor for various ratios of spot diameter to strip thickness and, accordingly, the permissible range of mean welding temperature depending on the temperature ripple. E.A.K.

N85-21566# Joint Publications Research Service, Arlington, Va.
NEW TYPES OF POWER SUPPLIES FOR ULTRASONIC PROCESSING EQUIPMENT Abstract Only
Aleksandr Aleksandrovich Korichev, Nikolay Konstantinovich Simonov, Viktor Vasilyevich Smorodinov, Petro Petrovich Chervinskiy, and Konstantin Konstantinovich Frolov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 47 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 106-113 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

A power supply with a thyristor-type high-frequency inverter was developed for high-power ultrasonic magnetostrictive processing equipment. It meets the basic five requirements of smooth current and voltage buildup, sufficiently long recovery time, absence of parasitic high-frequency switching cycles, symmetric load current, and wide load regulation within a given frequency range. It consists of two three phase banks of charging thyristors with series inductances, two three phase banks of discharging thyristors with series inductances, one bank of three commutating capacitors, and output transformer, and a pair of voltage limiting diodes. The performance of this inverter is evaluated for equivalent circuit diagrams for each characteristic period of the operating cycle of charging thyristors and discharging thyristors. E.A.K.

N85-21567# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING COOLDOWN PROCESS IN CRYO-

STAT OF CRYOGENIC ELECTRIC MACHINE Abstract Only
c31
Andrey Serafimovich Veselovskiy, Stanislav Sergeyevich Skvortsov, and Aleksandr Ivanovich Plis *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 50 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 50-53 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

Thermophysical processes in the cryostat of cryogenic electric machines during successive cooldown with nitrogen and helium are analyzed. The cryostat performance is calculated and the existence of heat transmission paths from the ambierit medium to the magnetic structure is considered. The thermal model of the machine includes the shield as an added mass. The mathematical model of the cooldown process consists of two differential equations of heat transfer for two heat exchangers in the system. The system of four equations with four equations with four unknown temperatures is solved simultaneously. Numerical integration of the differential equations is performed with a variable step cope with the fast decrease of thermal capacities upon approach to liquid helium temperatures. E.A.K.

N85-21422# Joint Publications Research Service, Arlington, Va.
COMPENSATION OF SKEW PASSBAND OF A SAW FILTER USING PREDISTORTION Abstract Only
Guanglun Huang *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 91 Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 3, no. 4, Oct. 1984 p 27-30 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-21568* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HEAT PIPE COOLED PROBE Patent
Charles J. Camarda, inventor (to NASA) and Lana M. Couch Issued 4 Dec. 1984 6 p Filed 13 Feb. 1981 Supersedes N81-24525 (19 - 15, p 2075)
(NASA-Case-LAR-12588-1; NAS 1.71:LAR-12588-1; US-Patent-4,485,670; US-Patent-Appl-SN-234222; US-Patent-Class-73-179; US-Patent-Class-73-708; US-Patent-Class-165-104.26) Avail: US Patent and Trademark Office CSCL 20D

The basic heat pipe principle is employed to provide a self-contained passively cooled probe that may be placed into a high temperature environment. The probe consists of an evaporator region of a heat pipe and a sensing instrument. Heat is absorbed as the working fluid evaporates in the probe. The vapor is transported to the vapor space of the condenser region. Heat is dissipated from the condenser region and fins causing condensation of the working fluid, which returns to the probe by gravity and the capillary action of the wick. Working fluid, wick and condenser configurations and structure materials can be selected to maintain the probe within an acceptable temperature range.
Official Gazette of the U.S. Patent and Trademark Office

N85-21569*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF EXPERIMENTAL SHAFT SEAL DATA FOR HIGH-PERFORMANCE TURBOMACHINES, AS FOR SPACE SHUTTLE MAIN ENGINES
R. C. Hendricks, M. J. Braun (Akron, Univ., Ohio), R. L. Mullen (Case Western Reserve Univ.), R. E. Burcham (Rocketdyne, Canoga Park, Calif.), and W. A. Diamond (Rocketdyne, Canoga Park, Calif.) 1985 19 p refs To be presented at the Symp. on Transport Phenomena in Rotating Machinery, Honolulu, Hawaii, 28 Apr. - 3 May 1985; sponsored in part by Michigan Univ., Hawaii Univ., ASME, Gas Turbine Soc. of Japan, and Turbomachinery Society of Japan
(NASA-TM-86928; E-2430; NAS 1.15:86928) Avail: NTIS HC A02/MF A01 CSCL 20D

High-pressure, high-temperature seal flow (leakage) data for nonrotating and rotating Raleigh-step and convergent-tapered-bore seals were characterized in terms of a normalized flow coefficient. The data for normalized Rayleigh-steip and nonrotating tapered-bore seals were in reasonable agreement with theory, but data for the rotating tapered-bore seals were not. The tapered-bore-seal operational clearances estimated from the flow data were significantly larger than calculated. Although clearances are influenced by wear from conical to cylindrical geometry and errors in clearance corrections, the problem was isolated to the shaft temperature - rotational speed clearance correction. The geometric changes support the use of some conical convergence in any seal. Under these conditions rotation reduced the normalized flow coefficiently by nearly 10 percent. Author

N85-21570*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID FUEL SPRAY PROCESSES IN HIGH-PRESSURE GAS FLOW
Robert D. Ingebo 1985 22 p refs Presented at 3rd Intern. Conf. on Liquid Atomization and Spray Systems, London, 8-10 Jul. 1985
(NASA-TM-86944; E-2463; NAS 1.15:86944) Avail: NTIS HC A02/MF A01 CSCL 20D

Atomization of single liquid jets injected downstream in high pressure and high velocity airflow was investigated to determine the effect of airstream pressure on mean drop size as measured with a scanning radiometer. For aerodynamic - wave breakup of liquid jets, the ratio of orifice diameter D sub o to measured mean drop diameter D sub m which is assumed equal to D sub 32 or Sauter mean diameter, was correlated with the product of the Weber and Reynolds numbers WeRe and the dimensionless group G1/square root of c, where G is the gravitational acceleration, 1 the mean free molecular path, and square root of C the root mean square velocity, as follows; D sub o/D sub 32 = 1.2 (WeRe) to the 0.4 (G1/square root of c) to the 0.15 for values of WeRe $>$ 1 million and an airstream pressure range of 0.10 to 2.10 MPa. G.L.C.

N85-21571*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
MODELING OF TRANSIENT HEAT PIPE OPERATION Semiannual Status Report, 19 Aug. 1984 - 18 Feb. 1985
Gene T. Colwell and James G. Hartley 20 Feb. 1985 32 p refs (Grant NAG1-392)
(NASA-CR-175496; NAS 1.26:175496) Avail: NTIS HC A03/MF A01 CSCL 20D

The overall goal is to gain a better understanding of the transient behavior of heat pipes operating under both normal and adverse conditions. Normal operation refers to cases where the capillary structure remains fully wetted. Adverse operation occurs when drying, re-wetting, choking, noncontinuum flow, freezing, thawing etc., occur within the heat pipe. The work was redirected towards developing the capability to predict operational behavior of liquid metal heat pipes used for cooling aerodynamic structures. Of particular interest is the startup of such heat pipes from an initially frozen state such as might occur during re-entry of a space vehicle into the Earth's atmosphere or during flight of hypersonic aircraft. G.L.C.

N85-21572*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF LARGE EDDY INTERACTION MODEL TO CHANNEL FLOW
S. K. Hong and M. W. Rubesin Feb. 1985 32 p refs

(NASA-TM-86691; A-85148; NAS 1.15:86691) Avail: NTIS HC A03/MF A01 CSCL 20D

A procedure utilizing an expansion of proper orthogonal functions (or modes) to predict a fully developed flow in channel is derived. To examine numerical and conceptual difficulties, preliminary computations are performed with assigned mean velocity, and turbulence is expressed with only the first mode. The nonlinear interactions of the components of the first mode are treated specifically, with the influence of higher modes neglected; this treatment required adjustment of the skewness and effective Reynolds number to assure energy equilibrium of the first mode. Computational results show that the first mode possesses the structural character similar to that of the entire flow. Author

N85-21573*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SURFACE-SLIP EQUATIONS FOR MULTICOMPONENT NON-EQUILIBRIUM AIR FLOW

R. N. Gupta (Old Dominion Univ.), C. D. Scott, and J. N. Moss Mar. 1985 97 p refs Presented at the AIAA 19th Thermophys. Conf., Snowmass, Colo., 25-28 Jun. 1984

(NASA-TM-85820; NAS 1.15:85820; AIAA-84-1732) Avail: NTIS HC A05/MF A01 CSCL 20D

Equations are presented for the surface-slip (or jump) values of species concentration, pressure, velocity, and temperature in the low-Reynolds number, high-altitude flight regime of a space vehicle. The equations are obtained from closed form solutions of the mass, momentum, and energy flux equations using the Chapman-Enskog velocity distribution function. This function represents a solution of the Boltzmann equation in the Navier-Stokes approximation. The analysis, obtained for nonequilibrium multicomponent air flow, includes the finite-rate surface catalytic recombination and changes in the internal energy during reflection from the surface. Expressions for the various slip quantities were obtained in a form which can be employed in flowfield computations. A consistent set of equations is provided for multicomponent, binary, and single species mixtures. Expression is also provided for the finite-rate, species-concentration boundary condition for a multicomponent mixture in absence of slip. E.A.K.

N85-21574*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NESTED SUBCRITICAL FLOWS WITHIN SUPERCRITICAL SYSTEMS

R. C. Hendricks, M. J. Braun (Akron Univ.), R. L. Wheeler, III (Akron Univ.), and R. L. Mullen 1985 12 p refs Proposed for presentation at the 20th Ann. Cavitation and Multiphase Flow Forum, Albuquerque, N. Mex., 24-26 Jun. 1985; sponsored by the American Society of Mechanical Engineers

(NASA-TM-86980; E-2518; NAS 1.15:86980) Avail: NTIS HC A02/MF A01 CSCL 20D

In supercritical systems the design inlet and outlet pressures are maintained above the thermaodynamic critical pressure P sub C. Designers rely on this simple rule of thumb to circumvent problems associated with a subcritical pressure regime nested within the supercritical pressure system along with the uncertainties in heat transfer, fluid mechanics, and thermophysical property variations. The simple rule of thumb is adequate in many low-power designs but is inadequate for high-performance turbomachines and linear systems, where nested two-phase regions can exist. Examples for a free-jet expansion with backpressure greater than P sub C and a rotor (bearing) with ambient pressure greater than P sub C illustrate the existence of subcritical pressure regimes nested within supercritical systems. Author

N85-21575*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A THREE-DIMENSIONAL SPECTRAL ALGORITHM FOR SIMULATIONS OF TRANSITION AND TURBULENCE Final Report

Thomas A. Zang and M. Yousuff Hussaini Mar. 1985 41 p refs Presented at the AIAA 23rd Aerospace Sci. Meeting, Reno, Nev., 14-17 Jan. 1985

(Contract NAS1-17070)

(NASA-CR-172561; ICASE-85-19; NAS 1.26:172561) Avail: NTIS HC A03/MF A01 CSCL 20D

A spectral algorithm for simulating three dimensional, incompressible, parallel shear flows is described. It applies to the channel, to the parallel boundary layer, and to other shear flows with one wall bounded and two periodic directions. Representative applications to the channel and to the heated boundary layer are presented. Author

N85-21576# Los Alamos Scientific Lab., N. Mex.

TRACR3D: A MODEL OF FLOW AND TRANSPORT IN POROUS/FRACTURED MEDIA

B. J. Travis May 1984 195 p refs

(Contract W-7405-eng-36)

(LA-9667-MS) Avail: NTIS HC A09/MF A01

The TRACR3D computer code, which solves the equations of transient two-phase flow and multicomponent transport in deformable, heterogeneous reactive porous/fractured media is described. Solutions are obtained by an implicit finite difference scheme for flow and semi-implicit approach for transport. The equations of the model, the numerical solution procedure, partial verification and validation of the model and user's guide are described. The TRACR3D can be used to study radioactive waste migration from repositories in unsaturated and saturated geology, chemical waste storage, soil water movement, and tests that define hydrocarbon reservoir structure. E.A.K.

N85-21577# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

PSEUDO-STATIONARY OBLIQUE-SHOCK-WAVE REFLECTIONS IN A POLYATOMIC GAS, SULFUR HEXAFLUORIDE

T. C. J. Hu Jan. 1985 178 p refs

(Contract DNA-001-83-C-0266; Grant AF-AFOSR-0096-82)

(UTIAS-TN-253; ISSN-0082-5263) Avail: NTIS HC A09/MF A01

Pseudo-stationary oblique shock wave reflections in sulfur hexafluoride were investigated experimentally and numerically. Over 150 experiments were conducted in a 10 x 18 cm Hypervelocity Shock Tube in the range of incident shock wave Mach number 125 < M subs < 8.0 and wedge angle 4 deg < theta sub w < 47 deg with initial pressures P sub 0 ranging from 4 to 267 torr (0.53 to 35.60 KPa) and initial temperatures T sub 0 near 300 K. The four major types of shock wave reflection, i.e., regular reflection (RR), single Mach reflection (SMR), complex Mach reflection (CMR) and double Mach reflection (DMR), were observed. These were studied with infinite fringe interferograms using a 23 cm dia field of view Mach-Zehnder interferometer. The isopycnics obtained and the density distributions along the wedge surface are presented for the various reflection processes. Four experimental results in argon, air, carbon dioxide and sulfur hexafluoride with the same wedge angle and similar Mach numbers are compared. G.L.C.

N85-21578# Institute of Space and Astronautical Science, Tokyo (Japan).

AN EXPERIMENTAL STUDY OF SPRAY THRUSTER

Takao Doi, Seichi Yasuda, and Ryojiro Akiba Sep. 1984 60 p refs

(Rept-613; ISSN-0285-0508) Avail: NTIS HC A04/MF A01

The forced evaporation of liquid is employed to produce working fluid for a thermal thruster system called Spray Thruster. The experimental model of spray thruster was tested in the wide range of the mass flow rate using Ethyl Ether, Pentane and Furan. The spray thruster is operated well in a vacuum environment without any energy additions. The exhaust stream consists of vapor containing droplets, the mass fraction of which is in the range from 0.8 to 0.9. The Isp reaches 28 seconds at the propellant tank temperature of 20 C for Ethyl Ether. The analysis of the nozzle flow shows that an equilibrium flow model and partially frozen flow model explain properly the measured thrust performance in the small and large mass flow rate operations, respectively. The effects of chemical properties of propellant, nozzle scale, propellant tank temperature and structural mass of the

system on the thrust performance were investigated in detail to obtain the fundamental design aspects. R.J.F.

N85-21579# National Aerospace Lab., Amsterdam (Netherlands).
UNSTEADY TRANSONIC PRESSURE MEASUREMENTS ON A SEMI-SPAN WIND-TUNNEL MODEL OF A TRANSPORT-TYPE SUPERCRITICAL WING (LANN MODEL). PART 2: PRESSURE DISTRIBUTIONS (PLOTTED) AND PLOTS OF THE VIBRATION MODES Final Technical Report, Apr. 1980 - Apr. 1982
J. J. Norsten, R. G. denBoer, and R. J. Zwaan Wright-Patterson AFB, Ohio Air Force Wright Aeronautical Labs. Mar. 1983 187 p
(Grant AF-AFOSR-0136-80)
(AD-A130488; AFWAL-TR-83-3039-Pt-2; NLR-TR-82069-U-Pt-2) Avail: NTIS HC A09/MF A01 CSCL 20/4

Unsteady transonic pressure measurements were performed on a semi-span wind-tunnel model of a transport-type supercritical wing, oscillating in pitch. For each run, the vibration mode and detailed steady and unsteady pressure distributions have been measured. Sectional as well as wing aerodynamic coefficients have been obtained by integration of the pressure distributions. The tests covered a Mach number range between 0.62 and 0.95. The reduced frequency covered a range between zero and a maximum value varying from 0.3 at M = 0.62 to 0.2 at M = 0.95 (related to half mean aerodynamic chord). Author

N85-21580# Stanford Univ., Calif. Dept. of Mechanical Engineering.
THEORETICAL AND EMPIRICAL STUDIES OF THE BASIC STRUCTURE OF TURBULENT SHEAR FLOWS, INCLUDING SEPARATED FLOWS AND EFFECTS OF WALL CURVATURE Final Report, 1 Dec. 1978 - 31 Dec. 1983
S. J. Kline, J. H. Ferziger, J. P. Johnston, R. J. Moffat, and B. J. Cantwell 15 May 1984 17 p
(Contract F49620-79-C-0010)
(AD-A149657; AFOSR-84-1175TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

This contract has included work on three related but distinct projects: (1) Separated flows, flow structure in detachment and reattachment zones, and diffuser computation methods; (2) Study of turbulence structure and heat convection in turbulent boundary layers on concave surfaces; and (3) Completion of a data library of complex turbulent flows in machine-readable form for use as input to modeling and for checking computations. GRA

N85-21581# University Coll. of Wales, Aberystwyth. Dept. of Physics.
THE BEHAVIOUR OF DETONATION WAVES IN SINGLE PHASE HETEROGENEOUS SYSTEMS Final Report, 30 Sep. 1982 - 29 Sep. 1983
D. H. Edwards 7 Mar. 1984 25 p
(Grant AF-AFOSR-0247-81)
(AD-A149825; AFOSR-84-1209TR; SR-2) Avail: NTIS HC A02/MF A01 CSCL 09/4

Fuel-air clouds, irrespective of their method of dispersal, must inevitably be of heterogeneous composition. The objective of this study (from Wales) is to examine the behavior of detonation waves in such clouds. Concentration gradients of precisely known strengths are created in a vertical detonation tube by removable slides. In general the shock transmitted into an inert gas develops a secondary shock or transverse wave oscillations according as to whether the gradient is steep or gradual. The rate of adjustment of the detonation in a concentration gradient to the local CJ conditions is found to be very rapid in the system used in the investigation. By using two slide valves at varying separation the characteristics of the reinitiation mechanism following a gap of inert gas are elucidated. GRA

N85-21582# Scientific Research Associates, Inc., Glastonbury, Conn.
SOLUTION OF THE THREE-DIMENSIONAL NAVIER-STOKES EQUATIONS FOR A STEADY LAMINAR HORSESHOE VORTEX FLOW Final Report, 1 Jun. 1982 - 30 Jun. 1984
W. R. Briley, R. C. Buggeln, and H. McDonald Dec. 1984 43 p
(Contract N00014-82-C-0466)
(AD-A149851; SRA-R84-920014-F) Avail: NTIS HC A03/MF A01 CSCL 12/1

A low Mach number formulation of the three-dimensional Navier-Stokes equations is solved for a steady laminar horseshoe vortex flow, using a time-iterative approach. A split linearized block implicit algorithm is used, with central spatial differences in a transformed coordinate system. The stability of this algorithm in three dimensions is examined for a scalar convection model problem, and results are obtained which suggest that the algorithm is both conditionally stable and rapidly convergent when nonperiodic inflow/outflow boundary conditions are used. A new form of artificial dissipation which acts along physical streamlines instead of coordinate grid lines is also tested and found to introduce less error when the local flow direction is not aligned with the computational grid. An accurate solution for a laminar horseshoe vortex flow is computed using an improved solution algorithm with small artificial dissipation. This solution does not change significantly when the mesh spacing is halved using (15 x 15 x 15) and (29 x 29 x 29) grids. Very good convergence rates were obtained, such that residuals were reduced by a factor of 1/100 in 30 and 60 iterations respectively, for 3,375 and 24,389 grid points. GRA

N85-21583# California Univ., Berkeley. Dept. of Mechanical Engineering.
TURBULENT CONVECTING FLOW IN A SQUARE DUCT WITH A 180 DEG BEND: AN EXPERIMENTAL AND NUMERICAL STUDY Ph.D. Thesis
R. W. Johnson 1984 537 p
(Contract N00014-80-C-0031)
(AD-A149969) Avail: NTIS HC A23/MF A01 CSCL 20/13

The research in this British dissertation was motivated by the desire to provide a comprehensive set of convective heat transfer data against which flow simulation schemes could be tested. Turbulent convecting three-dimensional flow of fluids in curved passages is frequently encountered in thermofluids equipment and systems. Although such flow situations have been too complex to adequately simulate computationally in the past, recent developments have provided physical models coupled with numerical techniques which can be applied to provide such simulations. Nevertheless, it has not been established to what extent such simulations provide accurate predictions and a sufficiently detailed data base does not exist to allow a searching evaluation of computer predictions. It is the conclusion of this collaborative study that significant inadequacies remain in the turbulence and wall models with respect to their ability to predict fully-three dimensional curved turbulent flow. Predictions for the Nusselt number distribution are in rather better agreement with the experimental data than are the hydrodynamic and temperature field predictions. GRA

N85-21584# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
WIND-TUNNEL RESEARCH ON THE MECHANICS OF PLUMES IN THE ATMOSPHERIC SURFACE LAYER Contractor Report, Jan. 1983 - Dec. 1984
J. E. Cermak, P. K. Shrivastava, and M. Poreh Dec. 1984 153 p
(Contract DAAK11-82-K-0004; DA Proj. 1L1-62622-A-552)
(AD-A150019; CRDC-CR-84098) Avail: NTIS HC A08/MF A01 CSCL 20/4

The diffusion of a neutrally buoyant gas emitted from point sources into neutral, stable, and unstable boundary layers that simulated atmospheric conditions were studied in a meteorological wind tunnel for flow over two surface roughnesses. Measurements were made of the mean flow velocities and temperatures, turbulence intensities, velocity correlations, and gas concentrations in the diffusing plume. Empirical models were developed for predicting diffusion under all three stabilities studied. GRA

N85-21585# Pennsylvania State Univ., University Park. Lab. for Applied Research.
RE-DESIGN OF ARL/HLF (HEATED LAMINAR FLOW) BODY NOSE REGION

G. C. Lauchle and S. L. Giner 5 Nov. 1984 25 p
(Contract N00024-79-C-6043)
(AD-A150063; ARL/PSU/TN-84-169) Avail: NTIS HC A02/MF A01 CSCL 20/4

The ARL (Penn State Univ.'s Applied Research Lab.) Heated Laminar Flow (HLF) body is a streamlined body with a pointed nose. One of the experimental objectives for the ARL/HLF body is to provide for limited (low flow) stagnation point fluid ejection. Because fluid ejection can, in many instances, create laminar instabilities farther downstream, it is important to have a stagnation region geometry that helps minimize the enhancement of these instabilities. This is best achieved by using a geometry that supports a very favorable pressure gradient in the ejection region. Such a geometry has been specified for the ARL/HLF body. This report presents the important analytical results which led to this redesigned nose region. The results include potential flow pressure distributions, boundary layer development, and disturbance amplification ratios, for both the original and modified nose geometry. In the absence of fluid ejection, it is concluded that the laminar flow performance of the modified body will be the same as that of the original body. GRA

N85-21586# Calspan Advanced Technology Center, Buffalo, N.Y. Physical Sciences Dept.
NUMERICAL STUDIES OF FLUID SPIN-UP FROM REST IN A PARTIALLY-FILLED CYLINDER Final Report, 1 Mar. 1981 - 30 Sep. 1984
Gregory F. Homicz Nov. 1984 54 p
(Contract DAAG29-81-C-0007)
(AD-A150079; CALSPAN-6856-A-2; ARO-17747.3-EG) Avail: NTIS HC A04/MF A01 CSCL 20/4

This is the final report describing a 3 year theoretical investigation of the dynamics of fluid spin-up in a partially-filled cylindrical cavity. The effort was divided into two phases. The first phase consisted of developing an extension of the earlier analyses of Wedemeyer, and of Goller and Ranov, to those cases where the liquid free surface intersects one or both endwalls. The simplifying assumptions of a columnar flow and the quasisteady treatment of the Ekman layer pumping of the secondary flow are retained. Earlier estimates of the Ekman layer pumping are modified heuristically for situations where the layer(s) no longer covers the entire wall. Also, due to the very steep free surface contour in the latter stages of spin-up, it was found to advantageous to develop the free surface equations in an axial, rather than radial, coordinate frame. This model and the resulting computer code are the subject of an earlier interim report and a subsequent paper submitted for journal publication. Accordingly, only a summary of this phase and its results is presented here. No experimental or numerical data were available against which to compare the simplified model's predictions for cases where the free surface intersects one or both endwalls. Accordingly, in the second phase of the program a more refined numerical model was developed, based on the full nonlinear Navier-Stokes equations. This is a finite difference code in which the primitive variable equations are solved in conservative form. The development of the governing equations, and the semiimplicit predictor-corrector scheme used to solve them, are presented in some detail. GRA

N85-21587# Calspan Advanced Technology Center, Buffalo, N.Y. Physical Sciences Dept.
EXPERIMENTAL STUDIES OF QUASI-TWO-DIMENSIONAL AND THREE-DIMENSIONAL VISCOUS INTERACTION REGIONS INDUCED BY SKEWED-SHOCK AND SWEPT-SHOCK BOUNDARY LAYER INTERACTIONS Final Technical Report, 15 Jan. 1982 - 31 Jul. 1984
Michael S. Holden Jul. 1984 80 p
(Contract F49620-82-C-0026; AF Proj. 2307)
(AD-A150080; CALSPAN-7018-A-2; AFOSR-84-1228TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report describes results from 3 experimental studies designed to examine the aerothermal characteristics of regions of three-dimensional shock wave/boundary layer interaction in high-speed flow over non-adiabatic surfaces. The objectives were: (1) to explore the basic mechanisms associated with 3D boundary layer separation in high-speed flows with special emphasis on the large heat transfer rates and gradients developed in the separation and reattachment regions of these flows; and (2) to obtain detailed sets of experimental measurements with which to extend the simple semi-empirical prediction methods to the hypersonic/cooled wall regime where no previous data existed. These studies were conducted at Mach 11 for Reynolds number of up to 40 million in Calspan's 96-Inch Shock Tunnel. In the first study we examined the effects of crossflow on the scale and properties of attached and separated region induced over a flat plate at the base of skewed/oblique shocks. Analysis of the detailed heat transfer and pressure measurements together with flow visualization demonstrated that, for sweep angles of up to 45 deg, crossflow had little effect on the size or characteristics of the interaction regions. In the second study the swept-shock was induced normal to the flat plate boundary layer by a shock generator mounted perpendicular to the flat plate. Our corner flow measurements demonstrated that, in highly-cooled hypersonic flows, the pressure rise to induce incipient separation is significantly larger than predicted by the semi-empirical methods. GRA

N85-21588# Akron Univ., Ohio. Dept. of Mechanical Engineering.
AN INVESTIGATION OF COMPRESSIBLE FLOWS OVER OPEN CAVITIES INCLUDING SHEAR LAYER THICKNESS EFFECTS Final Report, 1 May 1983 - 30 Jun. 1984
S. Graham Kelly 10 Sep. 1984 44 p
(Grant AF-AFOSR-0165-83; AF Proj. 2307)
(AD-A150086; AFOSR-84-1260TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The mathematical modelling of the two dimensional compressible for over an open rectangular cavity is considered. The flow field is divided into three regions: (1) the two-dimensional compressible flow outside the cavity which is governed by a convective wave equation; (2) the two dimensional flow inside the cavity for which the mean flow is neglected and thus is governed by the wave equation; and (3) the shear layer spanning the cavity which is the major focus of the investigation. The work of Tam and Block is followed and a method for determining the discrete frequencies of shear layer oscillation is determined including shear layer thickness effects and assuming that the shear layer grows downstream. A line source placed at the trailing edge is used to model the trailing edge interaction process and the analysis of a shear layer excited by a reflected wave of arbitrary frequency is considered. Since the mean flow in the shear layer is nonuniform, standard stability procedures do not work. The nonparallel effects are assumed to be weak. The method of multiple scales is used to analyze the nonparallel stability of the shear layer. The stability characteristics of the shear layer are used in an equation developed by Tam and Block to predict discrete oscillation frequencies. The numerical methods for solving the equations are discussed. GRA

N85-21589# Los Alamos Scientific Lab., N. Mex.
FRONT TRACKING AND TWO DIMENSIONAL RIEMANN PROBLEMS: A CONFERENCE REPORT
James Glimm, Christian Klingenberg, Oliver McBryan, Bradley Plohr, David Sharp, and Sara Yaniv 1984 22 p refs Presented at the 2nd Army Conf. on Applied Math. and Computing, Troy, N.Y., 22 May 1984 Prepared in cooperation with New York Univ., N.Y.
(Contracts W-7405-eng-36; DE-AC02-76ER-03077; DAAG29-83-K-0007; Grants NSF MCS-82-07965; NSF MCS-82-43730)
(DE85-002209; LA-UR-84-3209; CONF-8405221-3) Avail: NTIS HC A02/MF A01

A substantial improvement in resolution was achieved for the computation of jump discontinuities in gas dynamics using the method of front tracking. The essential feature of this method is that a lower dimensional grid is fitted to and follows the discontinuous waves. At the intersection points of these discontinuities, two-dimensional Riemann problems occur. Two-dimensional Riemann problems are studied from both numerical and theoretical points of view. Specifically included is a numerical solution for the

Mach reflection, a general classification scheme for two-dimensional elementary waves, and a discussion of problems and conjectures in this area. DOE

N85-21590# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemical Engineering.
ALGORITHM FOR THE SIMULATION OF TRANSIENT VISCO-ELASTIC FLOWS WITH FREE SURFACES
Roland Keunings Oct. 1984 45 p refs Sponsored in part by Army
(Contract DE-AC03-76SF-00098)
(DE85-002713; LBL-18469) Avail: NTIS HC A03/MF A01

A numerical procedure for solving a class of transient viscoelastic flows with free surfaces was considered. It is based on a Galerkin/Finite Element technique on deforming elements combined with a predictor-corrector scheme. The method is applied to the analysis of jet breakup caused by capillary forces. Non-linear effects known to experimentalists are predicted and a detailed comparison with asymptotic results is carried out. DOE

N85-21591# Brown Univ., Providence, R. I.
TWO-PHASE FLOW IN GEOTHERMAL SYSTEMS Bimonthly Progress Report, 1 Oct. - 30 Nov. 1984
P. F. Maeder, J. Kestin, R. DiPippo, D. E. Nikitopoulos, R. N. Laoulache, and R. Follansbee Dec. 1984 3 p
(Contract DE-AC03-84SF-12197)
(DE85-004692; DOE/SF-12197/T3) Avail: NTIS HC A02/MF A01

Several meetings attended by the author are itemized. The maintenance of the test facility, the experimental results of the two phase flow, and the design, fabrication and testing of the quick closing valve are discussed. Some theoretical studies including the developmental two phase well flow simulator computer model equations are reviewed. E.R.

N85-21592# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
FLOW MEASUREMENT BY LASER DOPPLER ANEMOMETRY IN A NUCLEAR FUEL ASSEMBLY M.S. Thesis
A. Kehoe Dec. 1984 206 p refs
(Contract DE-AC09-76SR-00001)
(DE85-003260; DPST-84-876) Avail: NTIS HC A10/MF A01

Development of a laser Doppler anemometer measurement system and its operation are examined. The system is designed for flow measurement in laboratory models of nuclear fuel assemblies. Use of the system is demonstrated by measuring turbulent velocity profiles in the laboratory model at full scale reactor flow rates. The reactors at the Savannah River Plant (SRP) are heavy water moderated and operate at low temperatures and pressures. Reactor power is currently limited by the temperature of the water in the nuclear fuel assembly. These temperature limits are conservatively calculated without allowing for any turbulent mixing. The design, fabrication and operation of a Plexiglas model fuel assembly are incorporated for the purpose of making turbulent velocity measurement via a laser Doppler anemometer system. DOE

N85-21593# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
ROBUST CALCULATION OF THREE-DIMENSIONAL TRANSONIC POTENTIAL FLOW BASED ON THE NONLINEAR GAS MULTIGRID METHOD AND A MIXED INCOMPLETE LOWER UPPER DECOMPOSITION/STRONGLY IMPLICIT PROCEDURE (ILU/SIP) ALGORITHM
A. J. vanderWees 4 Jan. 1984 19 p refs Presented at Lecture Series on De Praktijk van de Num. Wiskunde, Amsterdam Sponsored by Netherlands Agency for Aerospace Programs
(NLR-MP-84003-U; B8478512) Avail: NTIS HC A02/MF A01

A relaxation algorithm for use in a nonlinear FAS multigrid research code was investigated. The algorithm is fast, robust (stable convergence for all local flow directions) insensitive (good short wave damping for all possible mesh ratios) and involves only one free parameter. Numerical results for the Laplace equation and for a transonic model disturbance equation for the flow in a wind tunnel with a bump on the bottom are presented. Author (ESA)

N85-21594# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
MECHANISMS OF HEAT AND MASS TRANSFER ACROSS A DOUBLE-DIFFUSIVE INTERFACE Final Report, Sep. 1978 - Aug. 1984
Bing H. Ko and Kenneth A. Smith Jun. 1984 45 p refs
(Contract GRI-5014-353-0160)
(PB85-148468; GRI-84/0177) Avail: NTIS HC A03/MF A01 CSCL 21B

Flux measurements in an aqueous two-layer double-diffusive system using heat and NaCl confirmed the existence of a regime in which the ratio of the buoyancy fluxes (BFR) of salt and heat is independent of the stability ratio (R = beta(delta C)/alpha(delta T)). Linear analysis showed that the quiescent system can become unstable to small perturbations even when the lower layer is denser than the upper. If R is large, the most unstable mode presents as an oscillatory, antisymmetric pattern. GRA

N85-22219*# John Brown Univ., Siloam Springs, Ark. Dept. of Mechanical Engineering.
A STUDY OF THE COMPATIBILITY OF AN EXISTING CFD PACKAGE WITH A BROADER CLASS OF MATERIAL CONSTITUTIONS
Kenneth W. French, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 21 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20D

N85-22223*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical Engineering.
HYDRODYNAMIC STABILITY PROBLEM FORMULATED BY NUMERICAL SOLUTIONS OF THE NAVIER-STOKES EQUATIONS
J. M. Hyun *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 10p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20D

N85-22241*# Alabama A & M Univ., Normal. Dept. of Physics.
THEORETICAL INTERPRETATION OF THERMAL ARREST DATA FROM DIFFERENTIAL THERMAL ANALYSIS MEASUREMENTS
Jai-Ching Wang *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 13p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20M

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-21595* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SELF-CHARGING METERING AND DISPENSING DEVICE FOR FLUIDS Patent
Sonne L. Hooper (Pan American World Airways, Inc., Houston, Tex.) and Drel Setzer, inventors (to NASA) (Pan American World Airways, Inc., Houston, Tex.) Issued 18 Dec. 1984 7 p Filed 28 Sep. 1982 Supersedes N83-17856 (21 - 08, p 1184:I) Sponsored by NASA
(NASA-Case-MSC-20275-1; NAS 1.71:MSC-20275-1;

US-Patent-4,488,663; US-Patent-Appl-SN-425205;
US-Patent-Class-222-43; US-Patent-Class-222-48;
US-Patent-Class-222-309; US-Patent-Class-222-340) Avail: US Patent and Trademark Office CSCL 14B

A self-metering and dispensing device for fluids obtained from a pressurized fluid supply is discussed. Tubing and valving means permit the introduction of fluid into and discharge from a closed cylindrical reservoir. The reservoir contains a slideably disposed piston co-acting with a coil compression spring, with piston travel determining the amount of fluid in the reservoir. Once the determined amount of fluid is introduced into the reservoir, the fluid is discharged by the force of the coil compression spring acting upon the piston.

Official Gazette of the U.S. Patent and Trademark Office

N85-21596* National Aeronautics and Space Administration. Pasadena Office, Calif.

STATE-OF-CHARGE COULOMETER Patent

John J. Rowlette, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 12 Feb. 1985 15 p Filed 9 Apr. 1982 Supersedes N82-26630 (20 - 17, p 2404) Sponsored by NASA (NASA-Case-NPO-15759-1; NAS 1.71:NPO-15759-1;
US-Patent-4,499,424; US-Patent-Appl-SN-367136;
US-Patent-Class-324-427; US-Patent-Class-429-58) Avail: US Patent and Trademark Office CSCL 14B

A coulometer for accurately measuring the state-of-charge of an open-cell battery utilizing an aqueous electrolyte, includes a current meter for measuring the battery/discharge current and a flow meter for measuring the rate at which the battery produces gas during charge and discharge. Coupled to the flow meter is gas analyzer which measures the oxygen fraction of the battery gas. The outputs of the current meter, flow meter, and gas analyzer are coupled to a programmed microcomputer which includes a CPU and program and data memories. The microcomputer calculates that fraction of charge and discharge current consumed in the generation of gas so that the actual state-of-charge can be determined. The state-of-charge is then shown on a visual display.

Official Gazette of the U.S. Patent and Trademark Office

N85-21597* National Aeronautics and Space Administration. Pasadena Office, Calif.

CARBON GRANULE PROBE MICROPHONE FOR LEAK DETECTION Patent

Shakkottai P. Parthasarathy, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 12 Feb. 1985 5 p Filed 1 Jun. 1983 Supersedes N83-29595 (21 - 18, p 2929) Sponsored by NASA
(NASA-Case-NPO-16027-1; NAS 1.71:NPO-16027-1;
US-Patent-4,498,333; US-Patent-Appl-SN-500044;
US-Patent-Class-73-40.5A; US-Patent-Class-73-753) Avail: US Patent and Trademark Office CSCL 14B

A microphone which is not subject to corrosion is provided by employing carbon granules to sense sound waves. The granules are packed into a ceramic tube and no diaphragm is used. A pair of electrodes is located in the tube adjacent the carbon granules and are coupled to a sensing circuit. Sound waves cause pressure changes on the carbon granules which results in a change in resistance in the electrical path between the electrodes. This change in resistance is detected by the sensing circuit. The microphone is suitable for use as a leak detection probe in recovery boilers, where it provides reliable operation without corrosion problems associated with conventional microphones.

Official Gazette of the U.S. Patent and Trademark Office

N85-21598* National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.

THIN FILM STRAIN TRANSDUCER Patent

James L. Rand, inventor (to NASA) (Southwest Research Inst., San Antonio) Issued 12 Feb. 1985 7 p Filed 26 Aug. 1983 Supersedes N84-12448 (22 - 03, p 0376) Division of US Patent No. 4,425,808, US Patent Appl. SN-352827, filed 26 Feb. 1982 Sponsored by NASA
(NASA-Case-WLP-10055-2; NAS 1.71:WLP-10055-2;
US-Patent-4,498,231; US-Patent-4,425,808;
US-Patent-Appl-SN-526770; US-Patent-Appl-SN-352827;
US-Patent-Class-29-610SG) Avail: US Patent and Trademark Office CSCL 14B

A strain transducer system and process for making same is disclosed wherein a beryllium-copper ring having four strain gages disposed thereon is electrically connected in Wheatstone bridge fashion to output instrumentation. Tabs are bonded to a balloon or like surface with strain on the surface causing bending of the ring and providing an electrical signal through the gages proportional to the surface strain. A figure is provided which illustrates a pattern of a one-half ring segment as placed on a sheet of beryllium-copper for chem-mill etch formation, prior to bending and welding of a pair of the segments to form a ring structure.

Official Gazette of the U.S. Patent and Trademark Office

N85-21599 Department of the Navy, Washington, D. C.

REMOTE SELF-CONTAINED UNDERSEA MONITOR Patent

R. E. Page, inventor (to Navy) Issued 30 Oct. 1984 7 p
(AD-D011520; US-Patent-4,480,323; US-Patent-Appl-SN-386127;
US-Patent-Class-367-131) Avail: US Patent and Trademark Office CSCL 14/3

A remote oceanographic data recording system which is self-contained battery operated and removably attachable to an external surface of a submerged hull without a need to penetrate said hull is presented. The system is capable of gathering and recording oceanographic data and may be joined to the hull of a submarine without interfering in submarine operation in any way. The system receives analog ac and dc electrical input signals from a variety of oceanographic data sensors and converts the signals to digital data signals for recording on magnetic tape cassette. The housing the system is watertight and capable of withstanding external hydrostatic pressures up to 1620 psi. GRA

N85-21600 Department of the Navy, Washington, D. C.

ROTATING SQUID MAGNETOMETERS AND GRADIOMETERS Patent

T. G. Berlincourt, inventor (to Navy) Issued 18 Dec. 1984 18 p
(AD-D011529; US-Patent-4,489,274; US-Patent-Appl-SN-214839;
US-Patent-Class-324-248) Avail: US Patent and Trademark Office CSCL 14/2

A method and apparatus for measuring the strength, direction and gradients of an unknown magnetic field, through the use of rotating superconducting quantum interference devices (SQUID). The apparatus utilizes SQUID magnetometers, off-diagonal SQUID gradiometers and diagonal SQUID gradiometers mounted upon a rotatable and translatable element to a plurality of positions in space. The instantaneous outputs of a plurality of SQUID devices are electronically analyzed to provide the magnetic field and gradient measurements. GRA

N85-21601 Department of the Air Force, Washington, D.C.

RETINAL INFORMATION MAPPING SYSTEM Patent

D. L. Wallquist and G. G. Kuperman, inventors (to Air Force) Issued 22 Jan. 1985 8 p Supersedes AD-D009766
(AD-D011531; US-Patent-4,494,838; US-Patent-Appl-SN-398132;
US-Patent-Class-351-200) Avail: US Patent and Trademark Office CSCL 06/16

The mapping provides a capability for quantifying an external scene in a manner equivalent to the allocation at perceptual bandwidth in the human retina. The device samples the scene, either photographically or by video; records a digital version of the scene, processes the digital version so that the effects of the distribution rods in the retina provides the weighting for allocating signal processing bandwidth differentially across the scene in accordance with human physiological data, and produces a recording of the processed digital image. The processing uses a selected acuity factor as a parameter, a neighborhood is assigned to each pixel, with a radius r equal to(1.0+(acuity factor XR))/2.0, where R is the distance from the center of the image. The digital values of all pixels in the neighborhood are summed and the sum is divided by the number of pixels in the neighborhood to obtain

an average value. This value is then assigned to the pixel in forming a processed image frame. GRA

N85-21602 Department of the Navy, Washington, D. C.
PIEZOELECTRIC TRANSDUCER USING ELECTRICALLY POLED GAMMA-PHASE NYLON 11 Patent
B. A. Newman, K. D. Pae, and J. I. Scheinbeim, inventors (to Navy) Issued 4 Dec. 1984 5 p Supersedes AD-D009454
(AD-D011552; US-Patent-4,486,683; US-Patent-Appl-SN-315327; US-Patent-Class-310-800) Avail: US Patent and Trademark Office CSCL 11/9

Nylon 11 (gamma phase) is electrically poled after it is crystallized from commercially available Nylon 11 by rapidly crystallizing it from the molten state. The gamma-phase Nylon 11 so obtained exhibits high piezoelectric properties when poled under different poling conditions at different temperatures. The electrically poled gamma-phase Nylon 11 is used in a transducer. GRA

N85-21603 Department of the Air Force, Washington, D.C.
EDDY CURRENT TEST PROBE WITH CIRCUMFERENTIAL SEGMENTS AND METHOD OF TESTING MATERIAL SURROUNDING FASTENER HOLES Patent
K. M. Lakin, inventor (to Air Force) Issued 22 Jan. 1985 8 p Supersedes AD-D009507
(AD-D011554; US-Patent-4,495,466; US-Patent-Appl-SN-366732) Avail: US Patent and Trademark Office CSCL 13/5

This patent discloses an instrument having a multi-segmented cup core of a high permeability material with a center post. The outer wall of the cup contains equidistant holes and slots through which a plurality of individual windings are constructed to form a circulary array of pick-up coils. A primary winding or search coil is constructed around the center post. Excitation of the search coil induces eddy currents in adjacent multi-layered bolt hole regions which in turn produce a voltage in each of the pick-up coils. As a crack in the material under test will cause an abnormal distribution of eddy currents, a comparison of the voltage measurements of the specimen under test with those of a reference sample will detect the presence of a crack and its corresponding orientation. GRA

N85-21604*# Spectron Development Labs., Inc., Costa Mesa, Calif.
RESEARCH STUDY OF DROPLET SIZING TECHNOLOGY LEADING TO THE DEVELOPMENT OF AN ADVANCED DROPLET SIZING SYSTEM Final Report
C. F. Hess, A. E. Smart, and V. E. Espinosa Jan. 1985 88 p refs
(Contract NAS3-23538)
(NASA-CR-174839; NAS 1.26:174839) Avail: NTIS HC A05/MF A01 CSCL 14B

An instrument to measure the size and velocity of droplets was developed. The instrument uses one of two techniques, as appropriate. In the first technique two small laser beams of one color identify the center of a larger laser beam of a different color. This defines a region of almost uniform intensity where the light scattered by the individual droplets can be related to their size. The first technique uses the visibility of a Doppler burst and validates it against the peak intensity of the signal's pedestal. Results are presented for monodisperse, bimodal, trimodal, and polydisperse sprays produced by the Berglund-Liu droplet generator and a pressure nozzle. Size distributions of a given spray obtained using three different size ranges show excellent self-consistency in the overlapping region. Measurements of sprays of known characteristics exhibit errors in the order of 10%. The principles of operation and design criteria of the instrument are discussed in great detail. Author

N85-21605*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION RESULTS OF THE 700 DEG C CHINESE STRAIN GAUGES
Howard F. Hobart 1985 11 p refs Presented at the High Temperature Measurements for Experimental Mechanics Conf., Knoxville, Tenn., 27-28 Mar. 1985
(NASA-TM-86973; E-2502; NAS 1.15:86973) Avail: NTIS HC A02/MF A01 CSCL 14B

Gauges fabricated from specially developed Fe-Cr-Al-V-Ti-Y alloy wire in the Republic of China were evaluated for use in static strain measurement of hot gas turbine engines. Gauge factor variation with temperature, apparent strain, and drift were included. Results of gauge factor versus temperature tests show gauge factor decreasing with increasing temperature. The average slope is -3-1/2 percent/100 K, with an uncertainty band of + or - 8 percent. Values of room temperature gauge factor for the Chinese and Kanthal A-1 gauges averaged 2.73 and 2.12, respectively. The room temperature gauge factor of the Chinese gauges was specified to be 2.62. The apparent strain data for both the Chinese alloy and Kanthal A-1 showed large cycle to cycle nonrepeatability. All apparent strain curves had a similar S-shape, first going negative and then rising to positive value with increasing temperatures. The mean curve for the Chinese gauges between room temperature and 100 K had a total apparent strain of 1500 microstrain. The equivalent value for Kanthal A-1 was about 9000 microstrain. Drift tests at 950 K for 50 hr show an average drift rate of about -9 microstrain/hr. Short-term (1 hr) rates are higher, averaging about -40 microstrain for the first hour. In the temperature range 700 to 870 K, however, short-term drift rates can be as high as 1700 microstrain for the first hour. Therefore, static strain measurements in this temperature range should be avoided. A.R.H.

N85-21606*# Old Dominion Univ., Norfolk, Va. Research Foundation.
RESPONSE TIME CORRELATIONS FOR PLATINUM RESISTANCE THERMOMETERS IN FLOWING FLUIDS Final Report
Dhirendra K. Pandey and Robert L. Ash Feb. 1985 54 p refs
(Contract NAS1-17099)
(NASA-CR-172523; NAS 1.26:172523) Avail: NTIS HC A04/MF A01 CSCL 14B

The thermal response of two types of Platinum Resistance Thermometers (PRT's), which are being considered for use in the National Transonic Wind Tunnel Facility, were studied. Response time correlations for each PRT, in flowing water, oil and air, were established separately. A universal correlation, tau WOA = 2.0 + 1264, 9/h, for a Hy-Cal Sensor (with a reference resistance of 100 ohm) within an error of 20% was established while the universal correlation for the Rosemount Sensor (with a reference resistance of 1000 ohm), tau OA = 0.122 + 1105.6/h, was found with a maximum percentage error of 30%. The correlation for the Rosemount Sensor was based on air and oil data only which is certainly not sufficient to make a correlation applicable to every condition. Therefore, the correlation needs more data to be gathered in different fluids. Also, it is necessary to state that the calculation of the parameter, h, was based on the available heat transfer correlations, whose accuracies are already reported in literature uncertain within 20-30%. Therefore, the universal response constant correlations established here for the Hy-Cal and Rosemount sensors are consistent with the uncertainty in the input data and are recommended for future use in flowing liquids and gases. Author

N85-21607# National Bureau of Standards, Gaithersburg, Md.
ADVANCED THIN FILM THERMOCOUPLES
K. G. Kreider, S. Semancik, and C. Olson Oct. 1984 85 p refs
(NASA Order C-54715-D)
(NASA-CR-175541; NAS 1.26:175541; PB85-132322; NBSIR-84-2949) Avail: NTIS HC A05/MF A01 CSCL 14B

The fabrication, materials characterization, and performance of thin film platinum rhodium thermocouples on gas turbine alloys was investigated. The materials chosen for the study were the turbine blade alloy systems MAR M200+Hf with NiCoCrAlY and FeCrAlY coatings, and vane alloy systems MAR M509 with FeCrAlY. Research was focussed on making improvements in the problem areas of coating substrate stability, adhesion, and insulation reliability and durability. Diffusion profiles between the

substrate and coating with and without barrier coatings of Al2O3 are reported. The relationships between fabrication parameters of thermal oxidation and sputtering of the insulator and its characterization and performance are described. The best thin film thermocouples were fabricated with the NiCoCrAlY coatings which were thermally oxidized and sputter coated with Al2O3. GRA

N85-21608# Army Aeromedical Research Lab., Fort Rucker, Ala.
SUSPENSION TORQUES ON A GIMBALLED ELECTROSTATICALLY SUPPORTED GYROSCOPE AND REQUIREMENTS ON THE GYROSCOPE AND SPACECRAFT FOR THE RELATIVITY GYROSCOPE EXPERIMENT
G. M. Keiser Feb. 1985 104 p refs
Avail: NTIS HC A06/MF A01

The motional and geodetic drift rates of the angular momentum vector of a mechanical electrostatically supported gyroscope to an accuracy of 1 milli-arc-sec/year were measured. These drift rates are predicted by Einstein's General Theory of Relativity to be respectively .044 arc-sec/year and 6.9 arc-sec/year for a gyroscope in a 300 nautical mile circular polar orbit. Four electrostatically supported gyroscopes were mounted in a quartz block which is rigidly attached to a telescope. The quartz block assembly was cooled to 1.7 K by superfluid helium. The entire satellite which contains the gyroscopes will roll about the line of sight to a reference star. Attitude control jets keep the telescope aligned with the line of sight to the star to within 50 milliarc-sec. The peak-to-valley asphericity of the rotors is 0.8 micro inch or better. The orientation of the rotor spin axis was measured by using a SQUID magnetometer to detect changes in the magnetic flux due the London moment of the spinning superconducting rotor. The suspension torques were calculated on an electrostatically supported gyroscope with hexahedral electrodes. B.W.

N85-21609*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GSFC SPECIFICATION ELECTRONIC DATA PROCESSING MAGNETIC RECORDING TAPE
Donald F. Tinari and Jimmy L. Perry Mar. 1980 60 p refs
(NASA-TM-80599; NAS 1.15:80599) Avail: NTIS HC A04/MF A01 CSCL 14E

The design requirements are given for magnetic oxide coated, electronic data processing tape, wound on reels. Magnetic recording tape types covered by this specification are intended for use on digital tape transports using the Non-Return-to-Zero-change-on-ones (NRZI) recording method for recording densities up to and including 800 characters per inch (cpi) and the Phase-Encoding (PE) recording method for a recording density of 1600 cpi. B.W.

N85-21610*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A TWO-AXIS, SELF-NULLING SKIN FRICTION BALANCE Patent Application
Ping Tcheng, inventors (to NASA) and Frank H. Supplee, Jr. Filed 28 Feb. 1985 9 p
(NASA-Case-LAR-13294-1; NAS 1.71:LAR-13294-1; US-Patent-Appl-SN-706681) Avail: NTIS HC A02/MF A01 CSCL 14B

A skin friction force measuring device is described which is comprised of a first pivoted L shaped arm, a second arm pivoted on one end of the L shaped arm with a sensing element attached to an end of the second arm. In response to skin friction forces on the sensing element the arms are pivoted about the two pivots and two nulling means force the pivots back to their zero position. The outputs of the two nulling means are indicative of the skin friction forces along two perpendicular axes in the plane of the sensing element. NASA

N85-21611*# National Aeronautics and Space Administration, Washington, D. C.
CHARACTERISTICS OF THE BOAT INDUCTOR FOR KEEPING LIQUID METAL IN THE SUSPENDED STATE
A. A. Fogel, T. A. Siforova, and M. M. Mezdrogina Mar. 1985 14 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metally (USSR), no. 1, 1981 p 216-221 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77816; NAS 1.15:77816) Avail: NTIS HC A02/MF A01 CSCL 14B

Characteristics of the boat inductor for keeping liquid metal in the suspended state are examined. Behavioral features of the liquid metal, and the suspension boundary of liquid metal in the lower position are discussed. It is concluded that the inductor can be used to crystallize metals in the suspended state. Author

N85-21612# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
INTEGRATING NON-SEMANTIC KNOWLEDGE INTO IMAGE SEGMENTATION PROCESSES Ph.D. Thesis
R. R. Kohler Mar. 1984 185 p
(Contract N00014-75-C-0459; Grant NSF MCS-79-18209)
(AD-A149571; COINS-TR-84-04) Avail: NTIS HC A09/MF A01 CSCL 14/5

The dissertation develops several techniques for automatically segmenting images into regions. The basic approach involves the integration of different types of non-semantic knowledge into the segmentation process such that the knowledge can be used when and where it is useful. These processes are intended to produce initial segmentations of complex images which are faithful with respect to fine image detail, balanced by a computational need to limit the segmentations to a fairly small number of regions. Natural scenes often contain intensity gradients, shadows, highlights, texture, and small objects with fine geometric structure, all of which make the calculation and evaluation of reasonable segmentations for natural scenes extremely difficult. The approach taken by this dissertation is to integrate specialized knowledge into the segmentation process for each kind of image event that can be shown to adversely affect the performance of the process. At the center of our segmentation system is an algorithm which labels pixels in localized subimages with the feature histogram cluster to which they correspond, followed by a relaxation labeling process. However, this algorithm has a tendency to undersegment by failing to find clusters corresponding to small objects; it may also oversegment by splitting intensity gradients into multiple clusters, by finding clusters for mixed pixel regions, and by finding clusters corresponding to microtexture elements. In addition, the relaxation process often destroys fine structure in the image. GRA

N85-21613# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE 13.9 GHz RADIOMETER DESIGN
V. R. Reddy Oct. 1984 47 p
(Contract N00014-76-C-1105)
(AD-A149637; CRINC/RSL-TR-3311-3) Avail: NTIS HC A03/MF A01 CSCL 17/9

This report concerns the design of a 13.9 GHz total power radiometer. A large amount of literature is available on the subject, but this report addresses a detailed design concept without going into the mathematical analysis. All through the discussion, contrast is brought forth between a radar and radiometer, since the former is a more familiar system to most of the beginners in microwave system design. No stress is laid on the theoretical aspects of the radiometer. The system described has an overall noise figure of 7.67 dB and uses an integration time of about 1 sec. It is capable of a resolution of 2 K and the slope of the transfer function is set as 1 mV/1 K for convenience. GRA

N85-21614# Naval Research Lab., Washington, D. C.
EXPERIMENTAL TEST OF THE THREE SUBAPERTURE METHOD FOR ESTIMATING TARGET ELEVATION ANGLE Memorandum Report, Oct. 1982 - Sep. 1983
W. B. Gordon 31 Dec. 1984 32 p
(RR0-2105)
(AD-A149687; NRL-MR-5479) Avail: NTIS HC A03/MF A01 CSCL 17/3

Experimental radar measurements were taken on a target

aircraft flying low over a smooth reflecting sea for the purpose of testing the three subaperture method, which is a non-linear technique for estimating the elevation angle of a a target in the presence of multipath. The experimental array employed three vertically mounted dishes and three receivers, and the system stability proved to be more than adequate to permit interchannel gain and phase calibrations to be made by an appropriate numerical processing of the data. The standard deviations of the angle estimates were found to conform to theoretical expectations, but the biases were often large and exhibited a certain peculiar degeneracy in the vicinity of multipath nulls; viz, a sharp and rapid increase as the target approached a null followed by an abrupt change in sign as the target emerged from the null. Computer simulations were used to determine whether this peculiar angle flip-flop phenomenon could have been caused by: (1) refractive ray bending, (2) uncompensated array tilt, (3) diffuse scattering from the sea surface, or by (4) diffraction of the echo signal round obstacles located in the near vicinity of the radar. It was found that although the first two mechanisms can produce large biases, such biases are symmetric about the multipath nulls, whereas the latter two mechanisms can produce biases which are both large and skew-symmetric about the nulls. It is therefore concluded that one of the latter two mechanisms was responsible for the observed large biases. Author (GRA)

N85-21615# Air Force Academy, Colo. Dept. of Aeronautics.
THE SEVEN-HOLE PRESSURE PROBE
L. Reed, J. D. Mattingly, and F. M. Jonas 1984 85 p
(AD-A149799; USAFA-TN-84-9) Avail: NTIS HC A05/MF A01 CSCL 14/2

This paper documents recent and past developments with respect to the seven-hole pressure probe. Included are discussions on probe design, construction, calibration, and measurement capabilities. The effects on probe measurements in shear flows, as well as methods of correction, are also included. Finally, research applications in the measurement of unknown flowfields are presented. As shown, the seven-hole pressure probe is a valuable and highly accurate device for qualitatively or quantitatively documenting unknown flowfields. GRA

N85-21616# Chicago Univ., Ill.
NEW HIGH RESOLUTION SCANNING ION MICROPROBE AND FOCUSED ION BEAM APPLICATIONS Final Technical Report, 1 Jun. 1980 - 31 May 1984
R. Levi-Setti 31 Aug. 1984 154 p
(Contracts F49620-83-C-0110; F49620-80-C-0074)
(AD-A149992; AFOSR-84-1258TR) Avail: NTIS HC A08/MF A01 CSCL 14/2

The University of Chicago and Hughes Research Laboratories have successfully completed a four-year collaborative program for the development and construction of two 60 kV high-resolution, high current density ion-microscopes/microprobes. Performance evaluation tests with a liquid gallium ion source have thus far demonstrated focused spot diameters of 90 and 45 nanometers, excellent imaging capacity using ion-induced secondary electrons and ion signals, and unusual performance of a high-transmission secondary ion mass spectrometry system. Concurrently with the new microprobe development, previously existing prototype scanning ion microscope have been employed in fundamental studies of ion-solid interactions and contrast mechanisms in ion microscopy, where ion-channeling effects in crystalline materials yield images exhibiting extraordinary crystallographic contrast. Exploratory research applications of the new microprobes comprise elemental mapping at high spatial resolution (50 nm) of microelectronic structures and devices in gallium arsenide, studies of the elemental composition and mineral distribution in stony meteorites (chondrites), with emphasis on the analysis of the rims of primordial aggregate bodies (chondrules), the detection of staging domains in antimony pentachloride-intercalated graphites, elemental mapping in minerals of biological origin, in particular the detection the onset of calcification in bone tissues, and various approaches to focused ion beam microfabrication and microlithography, where structures with 100 nm linewidth have been demonstrated. Author (GRA)

N85-21617# Pacific Northwest Lab., Richland, Wash.
LEAK DETECTORS FOR ORGANIC RANKINE CYCLE POWER PLANTS: ON-LINE AND MANUAL METHODS
R. J. Robertus, K. H. Pool, C. H. Kindle, R. G. Sullivan, D. W. Shannon, and D. D. Pierce Oct. 1984 60 p refs
(Contract DE-AC06-76RL-01830)
(DE85-002792; PNL-5261) Avail: NTIS HC A04/MF A01

Two leak detector systems were designed, built, and tested at a binary-cycle (organic Rankine cycle) geothermal plant. One system is capable of detecting water in hydrocarbon streams down to 100 ppm liquid water ion liquid isobutane. The magnitude of the leak is estimated from the frequency at which solenoid-operated valve opens and closes. The second system can detect the presence of isobutane on water or brine streams down to 2 ppm liquid isobutane in liquid water or brine. The unit first cools the liquid stream if necessary then reduces the pressure in an expansion chamber so the hydrocarbon will vaporize. In brine streams flashed CO2 carries the hydrocarbon to a non-dispersive infrared analyzer (NDIR). The NDIR was modified to be highly selective for isobutane. One can estimate the size of a leak knowing the total gas-to-liquid ratio entering the leak detection system and the concentration of hydrocarbon in the gas phase. R.S.F.

N85-21618# Sandia Labs., Albuquerque, N. Mex. Div. 7452.
COMPARISON OF SHOCK-INDUCED DISPLACEMENTS WITH DISPLACEMENTS PRODUCED BY A CENTRIFUGE ACCELERATION
Thomas G. Priddy and Ronald Rodeman 1984 4 p refs Presented at the 3rd Intern. Modal Analysis Conf., Orlando, Fla., 28 Jan. 1985
(Contract DE-AC04-76DP-00789)
(DE85-000467; SAND-84-0985C; CONF-850118-5) Avail: NTIS HC A02/MF A01

Verification of the functional reliability of some electrical components under the action of mechanical shock is often desired. As an example, contact chatter of the normally open contact points in a thermal switch is a possible failure model which must be screened out by testing. Theoretically, it should be possible to do this acceptance testing with a centrifuge at a lower cost if one could determine the centrifuge acceleration level needed to produce the maximum displacement that could be realized under a given shock loading. A method was derived to determine this displacement relationship for the two different types of loads. A superposition-of-modes technique was used to develop the relationship. Numerical results are presented for a simple cantilever where closed-form solutions for modal parameters are readily available. This numerical result is then compared with the centrifuge-induced displacement to determine the desired relationship. This result was then successfully used to infer the centrifuge level needed to test a small, mechanically complicated, thermal switch. R.S.F.

N85-21619# California Univ., Berkeley. Lawrence Berkeley Lab.
MICROPROCESSOR-CONTROLLED ANODIC STRIPPING VOLTAMMETER FOR TRACE METAL ANALYSIS IN TAP WATER
R. G. Clem, F. W. Park, F. A. Kirsten, S. L. Phillips, and E. P. Binnall Jun. 1984 56 p refs
(Contract DE-AC03-76SF-00098)
(DE85-002781; LBL-18047) Avail: NTIS HC A04/MF A01

The construction and use of a portable, microprocessor controlled anodic stripping voltammeter for on-site simultaneous metal analysis of copper, lead and cadmium in tap water is discussed. The instrumental system is comprised of a programmable controller which permits keying in analytical parameters such as sparge time and plating time: a rotating cell for efficient oxygen removal and amalgam formation; and, data handling via a minicomputer or analog pen recorder. Plating and stripping potentials are controlled by a digital potentiostat; stripping is done using a staircase waveform with measurement of the current after a one msec delay. In this way charging current effects are

minimized. Results of tap water analysis showed 3 plus or minus 1 (MU)g/L lead, 22 plus or minus 0.3 (MU)g/L copper, and less than 0.2 (MU)g/L cadmium for a Berkeley, California tap water, and 1-1000 (MU)g/L Cu, 1 -2 (MU)g/L Pb for ten samples of Seattle, Washington tap water. Recommendations are given for a next generation instrument system. DOE

N85-21620# GA Technologies, Inc., San Diego, Calif.
INTENSIFIED CCD CAMERA SYSTEM FOR PLASMA DIAGNOSTICS
J. Smith, R. Chase, J. Garcia, C. Hsieh, and D. Vaslow Sep. 1984 18 p refs Presented at the 5th APS Topical Conf. on High Temp. Plasma Diagn., Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AT03-84ER-51044)
(DE85-002252; GA-A-17712; CONF-840922-19) Avail: NTIS HC A02/MF A01

It is possible to put together an intensified imaging system which has about the same sensitivity as photomultiplier tubes. Such a camera system, which utilizes a combination of image intensifiers and CCD image sensor, was constructed recently for the multipoint Thomson scattering diagnostic on Doublet III. The incoming image is first gated and amplified in the intensifier stages, then lens-coupled to a CCD camera cooled to LN2 temperature. The camera contains a RCA back-illuminated CCD of 320 x 512 pixels, has a good quantum efficiency (approx. 85% at 550 nm), and has a noise level per pixel of about 60 electrons. The system is controlled through CAMAC with a Photometric camera controller which allows a number of pictures to be taken and stored on the CCD chip for later readout. The multipicture capability is convenient for use with a multipulse Thomson scattering diagnostic to provide n sub e and T sub e profile measurements at several time points in a plasma shot. It is conceivable also that the camera system can be utilized to view directly the 2-D spatial distribution of plasma radiation at a particular energy in the range from near infrared to soft X-rays for information relating to plasma activities on flux surfaces. DOE

N85-21621# California Univ., Livermore. Lawrence Livermore Lab.
USE OF THE ORACLE DEMS IN DETERMINING THE RESPONSE OF COMPLEX SCIENTIFIC INSTRUMENTATION
J. M. Auerbach, B. J. DeMartini, and R. W. McCauley 27 Jun. 1984 8 p Presented at 3rd Intern. ORACLE User Group Conf., San Francisco, 19 Aug. 1984
(Contract W-7405-eng-48)
(DE85-001742; UCRL-90636; CONF-8408113-1) Avail: NTIS HC A02/MF A01

In the Laser Fusion Program at Lawrence Livermore National Laboratory, a single laser fusion experiment lasts only a billionth of a second but in this time high speed instrumentation collects data that when digitized will create a data bank of several megabytes. This first level of data must be processed in several stages to put it in a form useful for interpretation of the experiments. One stage involves unfolding the source characteristics from the data and response of the instrument. This involves calculating the response of the instrument from the characteristics of each of its components. The ORACLE DEMS for manipulation and archiving of the component data is described. DOE

N85-21622# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ULTRASENSITIVE MEASURING DEVICES
John Clarke Aug. 1984 10 p refs Presented at the 17th Intern. Conf. on Low Temperature Phys., Karlsruhe (West Germany), 15-22 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000672; LBL-18191; CONF-840842-31) Avail: NTIS HC A02/MF A01

Both dc and RF superconducting quantum interference devices (SQUIDs) are widely used as ultrasensitive detectors of magnetic flux. Present research is focussed largely on thin film dc SQUIDs fabricated with photolithographic techniques. The current status of this field is briefly reviewed. The impact of dc SQUIDs with improved sensitivity on noise thermometry and gravitational wave antennas is discussed. DOE

N85-21623# Sandia Labs., Livermore, Calif. Solar Components Div.
SOLID PARTICLE RECEIVER EXPERIMENTS: VELOCITY MEASUREMENTS
J. M. Hruby and V. P. Burolla Oct. 1984 42 p refs
(Contract DE-AC04-76DR-00789)
(DE85-000257; SAND-84-8238) Avail: NTIS HC A03/MF A01

Laser Doppler velocimetry and other photometric techniques are evaluated for measuring the average particle velocity in an ensemble of free-falling particles. The ability to obtain measurements in the presence of a radiant flux as high as 0.6 MW/m(2) was part of the evaluation. Optically dissimilar particles with diameters ranging from 0.1 mm to 1 mm were used in the study. Experimental results indicate that ensembles of particles do not behave as single isolated particles. The particle motion is dependent on particle volume fraction, and is quite unstable for falls greater than one meter. DOE

N85-21624# Oak Ridge Y-12 Plant, Tenn. Development Div.
PERFORMANCE OF CHROMEL VERSUS ALUMEL AND NICROSIL VERSUS NISIL THERMOCOUPLE ASSEMBLIES IN VACUUM AND ARGON BETWEEN 1000 DEG C AND 1200 DEG C
G. M. Ludtka, T. G. Kollie, R. L. Anderson (ORNL, Tenn.), and W. H. Christie (ORNL, Tenn.) 15 Oct. 1984 24 p refs Presented at the Ind. Temp. Meas. Symp., Knoxville, Tenn., 10-12 Sep. 1984
(Contracts DE-AC05-84OS-21400; DE-AC05-84OR-21400)
(DE85-000810; Y-DV-362; CONF-8409109-5) Avail: NTIS HC A02/MF A01

Prior work showed that Nicrosil versus Nisil (Type N) thermocouples exhibit improved thermoelectric stability at elevated temperatures in oxidizing environments greater than existing nickel base thermocouple alloys. This research evaluated the performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000(0)C and 1200(0)C. Both sheathed and bare thermocouple wires of various thicknesses were tested. The thermocouples were compared after exposure to the elevated temperatures by measuring thermoelectric drift from initial calibration data and by performing in place inhomogeneity tests. Under these test conditions, comparable behavior was exhibited by the Type K and Type N thermocouples. However, several conclusions could be made. Thick, bare thermocouples did as well as sheathed thermocouples especially at elevated temperatures where reaction with insulating materials is likely for sheathed thermocouples. Stainless steel sheathed thermocouples tended to exhibit larger maximum errors than Inconel sheathed thermocouples which is a result of contamination by diffusion of sheath component species into the thermoelements. DOE

N85-21625# Michigan Univ., Ann Arbor. Dept. of Physics.
IN-BEAM TESTS OF AN AIR-CORE SUPERCONDUCTING-SOLENOID PARTICLE SPECTROMETER
R. Stern, F. Recchetti, T. Casey, J. Janecke, P. Lister, D. Kovar, R. Janssens, R. Pardo, M. Vineyard, and J. Kolata 1984 4 p refs Presented at the Instrumentation for Heavy Ion Nucl. Res. Conf., Oak Ridge, Tenn., 22 Oct. 1984 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38; Grant NSF PHY-83-08072)
(DE85-004029; CONF-841005-3) Avail: NTIS HC A02/MF A01

A moderately sized air-core superconducting solenoid spectrometer was assembled and tested. The spectrometer solid angle is defined by one of five interchangeable apertures of various shapes and sizes and a small Faraday cup, located inside the scattering chamber, which can be removed to include smaller angles. Initial testing was done using an alpha source with a solid state detector at the focal point. In-beam tests were subsequently performed at the ANL superconducting linac. One set of tests consisted of a series of exposures of ca. 8x8 cm plastic track detectors located at the focal plane and centered on the mechani-

cal axis. Small-angle elastic scattering of (32) S + Au (E = 90 MeV) and (16)O+Au (E = 76 MeV) was imaged on the detectors with various fields and entrance apertures to study focusing properties and aberrations. The track detectors were suitably etched and the track density digitized using a CCD camera. A more complete set of measurements was taken using an XY-(delta)E-E-TOF detector. DOE

N85-21626# Sandia Labs., Albuquerque, N. Mex.
PERFORMANCE ASSESSMENT OF CLASS 1E PRESSURE TRANSMITTERS SUBJECTED TO ENVIRONMENTAL STRESSES
David T. Furgal and Charles M. Craft 1984 23 p refs Presented at the 12th Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 23 Oct. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001623; SAND-84-16550; CONF-8410142-31) Avail: NTIS HC A02/MF A01

The failure and degradation modes of unaged instruments exposed to environments within and beyond the design basis were evaluated. Current qualification test requirements, as they relate to electronic components in containment, were also evaluated. The salient findings of an experimental evaluation of pressure transmitter performance in harsh environments are summarized. The test matrix exposed five separate environments: (1) simulated loss of coolant accident (LOCA) steam condition alone; (2) temperature alone; (3) radiation alone; (4) simultaneous radiation and simulated LOCA steam conditions. Unaged equipment was tested to establish a baseline performance. DOE

N85-21627# Missouri Univ., Columbia.
INELASTIC SCATTERING IN CONDENSED MATTER WITH HIGH INTENSITY MOESSBAUER RADIATION Progress Report, 1 Aug. 1983 - 28 Feb. 1985
W. B. Yelon, G. Schupp, and J. G. Mullen Oct. 1984 16 p refs (Contract DE-AC02-83ER-45017)
(DE85-003531; DOE/ER-45017/1) Avail: NTIS HC A02/MF A01

The design and construction phases for the Microfoil Internal Conversion Electron (MICE) detector have been completed and it has been interfaced into the computer control for our high intensity Mossbauer scattering instrument. Thorough evaluation and optimization of MICE for low temperature operation are in progress. Data already taken, however, show that it gives an order of magnitude enhancement in signal-to-background compared to the Ge detector used in a transmission geometry. DOE

N85-21628# Argonne National Lab., Ill. Materials Science and Technology Div.
ELECTROMAGNETIC ACOUSTIC TRANSDUCERS (EMATS) FOR EROSION MONITORING
Karl J. Reimann May 1984 53 p refs
(Contract W-310-109-eng-38)
(DE85-004834; ANL/FE-84-12) Avail: NTIS HC A04/MF A01

Advantages of electromagnetic transducer (EMAT-based) systems motivated a study to establish criteria and requirements needed for erosion monitoring at elevated (operating) temperatures. The effort concentrated on three areas: (1) development of EMAT design parameters, (2) material-EMAT interaction, and (3) signal processing. Prototype horizontal shearwave EMATs, based on design parameters selected from computer calculations of the static field, were evaluated, and their performance was compared to the performance of piezoelectric transducers. Effects of surface roughness and temperature were determined for different test conditions. The results indicate that accurate wall thickness measurement can be performed at elevated temperature on rough surfaces. Modern data processing such as signal averaging on correlation improves the S/N ratio from 12 dB to 26 dB and enables wall thickness measurements with an accuracy of +-0.25% of total wall thickness. Additional efforts are needed to determine requirements of EMATs in scanning mode and pulsed static field operation. DOE

N85-21629# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
X-RAY GAUGE MEASURES AREAL DENSITY VARIATIONS AS SMALL AS 0.1%
David M. Stupin 1984 16 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3-7 Dec. 1984
(Contract W-7405-eng-36)
(DE85-003774; LA-UR-84-3634; CONF-841218-12) Avail: NTIS HC A02/MF A01

A gauge measures areal density variations as small as 0.1% in low density plastic foams and other materials. It has a spatial resolution of 0.5 mm. This system is safe, portable, easy to use, and is readily automated. The 6 keV X-ray flux from a Fe-55 source is collimated to a 0.5 mm diameter beam and attenuated by the sample. Transmitted X-rays are detected with a proportional gas detector and counted with a scalar timer. After measuring the X-ray attenuation in two areas of the sample, the areal density variation is calculated using an expression derived from I/I sub 0 = exp (-upx) where I is the transmitted flux, I sub 0 is the incident flux, u is the mass attenuation coefficient of the sample, p is the foam density, x is the thickness of the sample, and the product px = D is the areal density. Measurements sensitive to 1% and 0.1% areal density variations take three minutes and four hours per point, respectively, in 0.05 g/cu cm plastics, 1 cm thick. Absolute areal density is also measured to + or - 3% using existing X-ray attenuation tables. However, better accuracy may be obtained by calibrating the system with known samples. DOE

N85-21630# Pacific Northwest Lab., Richland, Wash.
MICROPROCESSOR-CONTROLLED ROTATING SHADOWBAND RADIOMETER
J. J. Michalsky, J. L. Berndt, and G. J. Schuster Aug. 1984 4 p ref Presented at the Intern. Radiation Symp., Perugia, Italy
(Contract DE-AC06-76RL-01830)
(DE85-003633; PNL-SA-12207; CONF-8408135-1) Avail: NTIS HC A02/MF A01

At the Pacific Northwest Laboratory (PNL), a microprocessor-based data logger/controller was developed and wed to another PNL-developed device: a movable shadowband radiometer. This combination, which promises to be an effective low-cost instrument for the reliable determination of three fundamental solar parameters, is described. DOE

N85-21537# Joint Publications Research Service, Arlington, Va.
OPERATING TIME METER FOR TAPE RECORDER Abstract Only
M. Ganzburg and O. Dyuffel *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 6 Transl. into ENGLISH from Radio (USSR), no. 8, Aug. 1984 p 38-40 (For primary document see N85-21531 12-31)
Avail: NTIS HC A04/MF A01

N85-21950# Joint Publications Research Service, Arlington, Va.
SPIROLIT-2 INSTRUMENT USED TO TEST PULMONARY VENTILATION
V. V. Zhuravlev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 113-115 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 76-77 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-22215*# Oregon Univ., Eugene. Inst. of Theoretical Science.
STUDY OF THE POTENTIAL USEFULNESS OF SUPERFINE HOLOGRAPHIC X-RAY GRATINGS IN AXAF AND ASTROPHYSICS IN GENERAL
Paul L. Csonka *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 25 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14E

N85-22228*# Middle Tennessee State Univ., Murfreesboro. Dept. of Chemistry and Physics.
GERMANIUM RESISTANCE THERMOMETER CALIBRATION AT SUPERFLUID HELIUM TEMPERATURES
Franklin Curtis Mason *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-21631* National Aeronautics and Space Administration. Pasadena Office, Calif.
PORTABLE REMOTE LASER SENSOR FOR METHANE LEAK DETECTION Patent
William B. Grant (JPL, California Inst. of Tech., Pasadena) and E. David Hinkley, Jr., inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 18 Dec. 1984 13 p Filed 24 Sep. 1982 Supersedes N83-33137 (21 - 21, p 3471) Sponsored by NASA (NASA-Case-NPO-15790-1; NAS 1.71:NPO-15790-1; US-Patent-4,489,239; US-Patent-Appl-SN-423016; US-Patent-Class-250-339; US-Patent-Class-250-343) Avail: US Patent and Trademark Office CSCL 20E

A portable laser system for remote detection of methane gas leaks and concentrations is disclosed. The system transmitter includes first and second lasers, tuned respectively to a wavelength coincident with a strong absorption line of methane and a reference wavelength which is weakly absorbed by methane gas. The system receiver includes a spherical mirror for collecting the reflected laser radiation and focusing the collected radiation through a narrowband optical filter onto an optial detector. The filter is tuned to the wavelength of the two lasers, and rejects background noise. The output of the optical detector is processed by a lock-in detector synchronized to the chopper, and which measures the difference between the first wavelength signal and the reference wavelength signal. R.J.F.

N85-21632 Department of the Air Force, Washington, D.C.
PULSE TRANSFORMER PACKAGE FOR IMPEDANCE MATCHING A LASER DIODE TO A TRANSMISSION LINE Patent
G. M. Bender, inventor (to Air Force) Issued 27 Nov. 1984 4 p Supersedes AD-D010350
(AD-D011499; US-Patent-4,485,361; US-Patent-Appl-SN-452604; US-Patent-Class-333-32) Avail: US Patent and Trademark Office CSCL 20/5

This patent covers a package for matching the characteristics impedance of a transmission line to the impedance of a pulsed semiconductor laser diode so that short duration pulse of light can be produced with a fast repetition rate. The package has a toroidal transformer in a cavity of a mainbody, with a multiturn primary connected to a transmission line. The laser diode is mounted at the edge of a known sandwich between two thin metal plates separated by an insulating layer. A space and metal cover cap are placed over the sandwich, and a screw passing through holes of all the parts is threaded into the main body. The screw passing through the transformer core forms a one-turn secondary. Not only does this allow the matching of the characteristic impedance, but also provides heat sinking for the diode. Assembly with a screw makes the unit easy to fabricate, and to replace the laser diode sandwich. GRA

N85-21633 Department of the Air Force, Washington, D.C.
AXIAL FLOW LASER CAVITY Patent
P. J. Ortwerth and A. I. Lampson, inventors (to Air Force) Issued 13 Nov. 1984 5 p Supersedes AD-D009569
(AD-D011506; US-Patent-4,483,006; US-Patent-Appl-SN-375621) Avail: US Patent and Trademark Office CSCL 20/5

This patent discloses an improved gaseous laser device which comprises a generally tubular laser discharge tube having a laser window at each end. Each window disposed at an angle to the lasing axis of the device corresponding substantially to the Brewster's angle is characteristic of the material comprising the windows, and directs substantial uniform flow of gaseous laser medium into and out of the discharge tube at said angle. A choked gaseous exhaust exit for canceling cavity disturbances is provided within the device. Laser optics defining an optical resonant cavity of the laser device may be disposed external of the discharge tube and windows. GRA

N85-21634 Department of the Air Force, Washington, D.C.
LASER CLOCK Patent
R. L. Facklam, inventor (to Air Force) Issued 13 Nov. 1984 6 p Supersedes AD-D010362
(AD-D011513; US-Patent-4,482,259; US-Patent-Appl-SN-498238; US-Patent-Class-368-118) Avail: US Patent and Trademark Office CSCL 17/7

A laser clock includes a linear laser in one embodiment of the clock and a ring laser gyro in the other embodiment. The linear laser is frequency stabilized and utilizes a single active medium in the form of a low pressure gas, such as He-Ne, with a Doppler broadened gain curve. The ring laser gyro is a four frequency laser with a Faraday rotor. Detector and electronic circuitry associated with the laser of each embodiment detect a beat frequency and coverts it to a clock signal. GRA

N85-21635 Department of the Air Force, Washington, D.C.
MULTIPLE DOUBLE HETEROJUNCTION BURIED LASER DEVICE Patent
F. Z. Hawrylo, inventor (to Air Force) Issued 20 Nov. 1984 7 p Supersedes AD-D009638
(AD-D011519; US-Patent-4,484,332; US-Patent-Appl-SN-384292; US-Patent-Class-372-250) Avail: US Patent and Trademark Office CSCL 20/5

A multiple double heterojunction buried laser device is formed of a bulk structure, a plurality of double heterojunction buried lasers and electrical means. The bulk structure includes, in order, an InP:Sn substrate, an InP:Te first layer, an InP:Zn second layer, an InP:Te third layer, and a capping n-type fourth layer. Multiple stripe-like openings are formed in the above layers and double heterojunction buried lasers are formed therein. The double heterojunction buried lasers include the following layers in order: an InP:Te heterojunction first layer, an InGaAsP quarternary second layer, an InP:Zn heterojunction third layer, and an InGaAsP:Zn capping fourth layer. A reverse biased junction is formed in said bulk structure so that current is confined to the lasers; the active lasing regions are above the p-type layers of the p-n reversed bias junction. The double heterojunction buried lasers can be cleaved from the laser device and operated as a single device. Author (GRA)

N85-21636 Department of the Air Force, Washington, D.C.
TRANSMISSIVE DEWAR COOLING CHAMBER FOR OPTICALLY PUMPED SEMICONDUCTOR RING LASERS Patent
M. M. Salour and A. Fuchs, inventors (to Air Force) Issued 29 Jan. 1985 8 p Supersedes AD-D010980
(AD-D011550; US-Patent-4,495,782; US-Patent-Appl-SN-552555; US-Patent-Class-62-514) Avail: US Patent and Trademark Office CSCL 13/4

A transmission Dewar cooling chamber having a housing for supporting a semiconductor crystal therein within a temperature controlled environment is disclosed. The housing has walls made partially of material transmissive to a preselected wavelength in order to allow the passing of a beam of electromagnetic radiation completely through the housing. In addition, mounting means are provided to move the housing in at least two dimensions. Securing the semiconductor crystal in place within the housing is a uniquely designed frame/mount arrangement which aids in establishing the temperature controlled environment for the crystal while also allowing the beam of electromagnetic radiation to pass completely through the crystal. GRA

N85-21637 Department of the Air Force, Washington, D.C.
OPTICALLY PUMPED IODINE MONOFLUORIDE LASER Patent
S. J. Davis and L. Hanko, inventors (to Air Force) 11 Dec. 1984 7 p Supersedes AD-D009252
(AD-D011555; US-Patent-4,488,311; US-Patent-Appl-SN-324346; US-Patent-Class-372-89) Avail: US Patent and Trademark Office CSCL 20/5

In accordance with the present invention, there is provided a short wavelength chemical laser device which utilizes iodine monofluoride as a lasing medium. The device is an optically pumped iodine monofluoride laser in which the ground state iodine monofluoride is produced by reacting iodine and fluorine to form a flame within which the monofluoride is produced. The monofluoride is then pumped or excited with a high energy, broadband dye laser. The device of this invention has particular utility as a gain probe for chemically generated IF lasers and as a useful prototype to study lasing in reactive flows. It can be used to obtain output spectra and powers, as well as study reactant densities and the effects of mixing on visible lasing. Such data is invaluable in designing and constructing visible lasers. The primary object of this invention is to provide a simple, efficient and dependable short wavelength gas laser. Another object of this invention is to provide an optically pumped gas laser in which the lasing medium is chemically produced in the optical resonator of the laser immediately before lasing commences. Still another object of this invention is to provide a gas laser in which visible lasing occurs within the flame resulting from the chemical reaction utilized to produce the lasing medium. GRA

N85-21638# Los Alamos Scientific Lab., N. Mex.
TRANSMISSION AND REFLECTION OF LASER BEAMS PROPAGATING THROUGH AEROSOL CLOUDS IN SPACE
A. Zardecki and S. A. W. Gerstl Mar. 1984 42 p refs
(Contract W-7405-eng-36)
(LA-9998-MS) Avail: NTIS HC A03/MF A01

A parametric study to evaluate the shielding effectiveness of a cloud of carbonaceous and model aerosols in space against a collimated laser beam is summarized. The modeling is generally based on the small-angle approximation to multiple scattering; for aerosols having a size distribution corresponding to inventory smokes, the diffusion theory is employed. Both the power delivered to the target and the reflected signal are computed as a function of optical depth with the single-scattering albedo varied parametrically in the range from 0.1 to 0.99. The study establishes the importance of multiple-scattering effects when the single-scattering albedo is larger than 0.3. M.G.

N85-21639* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF AND APPARATUS FOR MEASURING TEMPERATURE AND PRESSURE Patent
Charles L. Korb and James E. Kalshoven, Jr., inventors (to NASA) Issued 15 Jan. 1985 17 p Filed 28 May 1982 Supersedes N82-29580 (20 - 20, p 2829)
(NASA-Case-GSC-12558-1; NAS 1.71:GSC-12558-1; US-Patent-4,493,553; US-Patent-Appl-SN-383086; US-Patent-Class-356-43; US-Patent-Class-73-705; US-Patent-Class-356-45; US-Patent-Class-374-137) Avail: US Patent and Trademark Office CSCL 20E

Laser beams are transmitted through gas to a reflecting target, which may be either a solid surface or particulate matter in gas or the gas molecules. The return beams are measured to determine the amount of energy absorbed by the gas. For temperature measurements, the laser beam has a wavelength at which the gas exhibits a relatively temperature sensitive and pressure insensitive absorption characteristic for pressure measurements, the laser beam has a wavelength at which the gas has a relatively pressure sensitive and temperature insensitive absorption characteristic. To reduce the effects of scattering on the absorption measurements a reference laser beam with a weak absorption characteristic is transmitted colinearly with the data beam having a strong absorption characteristic. The two signals are processed as a ratio to eliminate back scattering. Embodiments of transmitters and receivers described include a sequential laser pulse transmitter and receiver, a simultaneous laser pulse transmitter and receiver.
Official Gazette of the U.S. Patent and Trademark Office

N85-21640# Maryland Univ., College Park. Dept. of Electrical Engineering.
LIFE STUDY OF RF EXCITED Hg ARC LAMPS AND CO2 WAVEGUIDE LASERS Annual Progress Report
U. Hochuli 12 Jan. 1985 28 p
(Contract N00014-79-C-0312; RR0-1107)
(AD-A149618) Avail: NTIS HC A03/MF A01 CSCL 13/1

An air cooled, electrodeless, high pressure Hg-arc lamp, excited with 800 W 2.45 GHz RF power, has delivered full output for the first 1000 hours. After 5000 hours, the 366 nm output power was 40 percent of the initial output. 140 MHz RF excited 2W CW CO2 waveguide lasers have shown life of 10,000 to 20,000 hours. This result was achieved with CO as well as with N2 bearing gas mixtures and for structures with internal electrodes as well as with capacitive wall coupling. One laser still had 60 percent of its original power left after 50,000 10-minute on-off cycles. Preliminary RF gas conductance measurements are also reported. GRA

N85-21641# Defence Research Establishment Valcartier (Quebec).
ON THE INVERSION OF THE LIDAR EQUATION
B. T. N. Evans Nov. 1984 58 p
(AD-A149653; DREV-4343/84) Avail: NTIS HC A04/MF A01 CSCL 17/8

A modified form of the Klett inversion method of the lidar equation is developed. The accuracy of this inversion method is explored and validated. Unlike previous inversions, this one does not require making a guess for each lidar return to initiate the calculation. Included are discussions of the other inversion methods. The assumptions contained in the single-scatter lidar equation and in the inversion method are outlined as is their relative importance. Special attention is given to the backscatter versus total extinction relation, multi-scattering and non-ideal detector response. The lidar equation is the governing relation which permits the calculation of extinction and estimates of concentration under conditions of single scattering from a given lidar return. However, to obtain the solution, an inversion of the equation must be performed. GRA

N85-21642# Naval Research Lab., Washington, D. C.
BETATRON-SYNCHROTRON DETRAPPING IN A TAPERED WIGGLER FREE ELECTRON LASER Memorandum Report, Jun. 1979 - Nov. 1984
P. Sprangle and C. M. Tang 31 Dec. 1984 15 p
(Contract DE-AI05-83ER40117)
(AD-A149686; NRL-MR-5445) Avail: NTIS HC A02/MF A01 CSCL 20/7

Betatron-synchrotron resonance detrapping is shown to take place when the wiggler magnetic field amplitude is tapered. This resonance exists even if the radiation wavefronts are not curved and is only dependent on the transverse gradient of the tapered wiggler field. Author (GRA)

N85-21643# Naval Research Lab., Washington, D. C.
THE EFFECTS OF SURFACE WAVES ON RF DISCHARGE PUMPED LASERS
W. M. Bollen, R. W. Waynant, and C. P. Christensen 30 Jan. 1985 24 p
(AD-A149689; NRL-MR-5432) Avail: NTIS HC A02/MF A01 CSCL 20/5

Discharge lasers pumped by radiofrequency are limited in the amount of RF power that can be absorbed. Since the RF discharge avalanches to high electron density, normal waveguide modes are eventually cut off, and further propagation takes place as surface waves which couple poorly to material in the mode volume of a stable laser resonator. Solutions to this problem can be found by: (1) tailoring the microwave energy or possibly using a very attaching gas to control the avalanche; (2) optimizing the surface

wave coupling; and (3) optimizing the optical coupling to the excited region using an unstable resonator. Author (GRA)

N85-21644# Materials Research Labs., Ascot Vale (Australia).
A 50-kW ELECTRIC-DISCHARGE CO2 LASER
R. E. Whitcher and R. McLeary Jul. 1984 20 p
(AD-A149779; MRL-R-933) Avail: NTIS HC A02/MF A01 CSCL 20/5

This report describes an electric-discharge carbon dioxide mixing laser which has been designed and constructed at MRL. The laser, which utilizes a plasma injection stabilized discharge in atmospheric-pressure nitrogen, delivers an output power of 50 kW for reservoir-limited durations of 3 seconds at an overall efficiency of 7%. Author (GRA)

N85-21645# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
RESONANCE BETWEEN BETATRON AND SYNCHROTRON OSCILLATIONS IN A FREE ELECTRON LASER: A 3-D NUMERICAL STUDY Interim Report
C. M. Tang and P. Sprangle 30 Jan. 1985 21 p
(DARPA Proj. 3817)
(AD-A150059; NRL-MR-5499) Avail: NTIS HC A02/MF A01 CSCL 20/5

We analyze the effect of betatron and synchrotron resonance on the gain process of the free electron laser (FEL) including betatron oscillations, finite beam emittance, self-consistent electron dynamics and a 3-D radiation field. Betatron oscillations force the electrons to be affected by an oscillatory radiation amplitude and phase in a Gaussian resonator radiation field. We show that not only can the radiation phase variation cause a resonance between approximately twice the betatron wavenumber and the synchrotron wavenumber, but the radiation amplitude variation in an FEL with efficiency enhancement schemes or just a tapered magnetic wiggler field amplitude Bw can also have a similar resonance effect. Numerical results for a 10 micrometer FEL are given. We find that for short wigglers, the effect of the betatron-synchrotron instability on the gain is negligible for Gaussian electron beams with radius less than 0.8 times the radiation beam spot size. GRA

N85-21646# California Univ., Livermore. Lawrence Livermore Lab.
ENHANCING THE PERFORMANCE OF A HIGH-GAIN FREE ELECTRON LASER OPERATING AT MILLIMETER WAVELENGTHS
W. A. Barletta, B. Anderson, W. M. Fawley, V. K. Neil, T. J. Orzechowski, D. Prosnitz, E. T. Scharlemann, S. M. Yarema, A. C. Paul, and D. Hopkins 25 Oct. 1984 21 p refs Presented at Workshop on Coherent and Collective Properties of Relativistic E-Beams and Electromagnetic Radiation, Villa Olmo, Italy, 13 Sep. 1984
(Contracts DE-AC03-76SF-00098; W-7405-eng-48)
(DE85-000862; UCRL-91123; CONF-8409163-1) Avail: NTIS HC A02/MF A01

A high-gain, high extraction efficiency, free electron laser (FEL) amplifier operating at the Experimental Test Accelerator (ETA) at 34.6 GHz has demonstrated a small signal gain of 13.4 dB/m. With a 30 kW input signal, the amplifier has produced a saturated output of 80 MW and a 5% extraction efficiency. Comparison of these results with a linear model at small signal levels indicates that the amplifier can deliver saturated output starting from noise, if the brightness of the electron beam is sufficiently high. The brightness of the ETA is far below that possible with optimized choice of practical design characteristics such as peak voltage, cathode type, gun electrode geometry, and focusing field topology. In particular, the measured brightness of the ETA injector is limited by plasma effects from the present cold, plasma cathode. DOE

N85-21647# California Univ., Livermore. Lawrence Livermore Lab. Laser Program.
ADVANCED CRYSTALLINE LASER MATERIALS
William F. Krupke 1984 8 p refs Presented at the NASA Workshop on Tunable Solid State Lasers for Remote Sensing, Stanford, Calif., 1-3 Oct. 1984
(Contract W-7405-eng-48)
(DE85-003142; UCRL-91670; CONF-8410201-1) Avail: NTIS HC A02/MF A01

The scaling laws for zig-zag and flow cooled disk amplifiers were analyzed, materials' figures of merit were defined, and laser performance applications maps were developed. Efforts are being made to synthesize, characterize, select, and develop new materials useful for a variety of robust laser applications. DOE

N85-21648# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 210.
DEVELOPMENT OF MINIATURE LASER DOPPLER ANEMOMETERS [ENTWICKLUNG VON MINIATUR-LASER-DOPPLER-ANEMOMETERN]
B. Ruck Aug. 1984 51 p refs In GERMAN
(KU-SFB-210/ET/3) Avail: NTIS HC A04/MF A01

Miniature laser Doppler anemometers (LDA) based on optical waveguides were developed. The application of optical waveguides for the transmission of coherent radiation in this measuring method is discussed, emphasizing the connection between laser probe and laser unit. Development and construction of an LDA backscattering probe are described. The probe systems allow many central and peripheral measurements in techniques and environments previously excluded for safety, space, time, and financial reasons. The operation possibility with a single power supply unit is especially attractive. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-21649* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CONNECTION SYSTEM Patent
Bruce McCandless, II, inventor (to NASA) Issued 20 Nov. 1984 9 p Filed 30 Jun. 1982 Supersedes N82-31689 (20 - 22, p 3137)
(NASA-Case-MSC-20319-1; NAS 1.71:MSC-20319-1; US-Patent-4,483,639; US-Patent-Appl-SN-393582; US-Patent-Class-403-317; US-Patent-Class-292-252; US-Patent-Class-81-177G) Avail: US Patent and Trademark Office CSCL 13I

A mechanical connection system comprises a first body defining a receptable and a second body defining a pin matingly receivable in the receptacle by relative movement in a first directional mode. A primary latch is engagable between the two bodies to retain the pin in the receptacle. The primary latch is reciprocable in a second directional mode transverse to the first directional mode. A lock member carried by one of the bodies is operatively associated with the primary latch and movable, transverse to the second directional mode, between a locking position maintaining engagement of the primary latch and a releasing position permitting release of the primary latch. The lock includes an operator portion engagable to move the lock member from its locking position to its releasing position. The operator is located internally of the first body. An actuator is selectivity insertable into and disengagable from the first body. The actuator is movable relative to the first body when it is inserted for engagement with and operation of the operator.

Official Gazette of the U.S. Patent and Trademark Office

N85-21650* National Aeronautics and Space Administration. Pasadena Office, Calif.
INGOT SLICING MACHINE AND METHOD Patent
Yu Shen Kuo, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 9 Oct. 1984 13 p Filed 11 Jun. 1982 Sponsored by NASA

(NASA-Case-NPO-15483-1; NAS 1.71:NPO-15483-1; US-Patent-4,475,527; US-Patent-Appl-SN-387648; US-Patent-Class-125-13R; US-Patent-Class-82-90; US-Patent-Class-83-664; US-Patent-Class-83-676; US-Patent-Class-125-15; US-Patent-Class-51-73R) Avail: US Patent and Trademark Office CSCL 13H

An improved method for simultaneously slicing one or a multiplicity of boules of silicon into silicon wafers is described. A plurality of vertical stacks of horizontal saw blades of circular configuration are arranged in juxtaposed coaxial alignment. Each blade is characterized by having a cutting diameter slightly greater than the cutting diameter of the blade arranged immediately above, imparting a simultaneous rotation to the blades.

Official Gazette of the U.S. Patent and Trademark Office

N85-21651* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

REUSABLE THERMAL CYCLING CLAMP Patent

William J. Debnam, Jr., Archibald L. Fripp, and Roger K. Crouch, inventors (to NASA) Issued 1 Jan. 1985 6 p Filed 17 Nov. 1981 Supersedes N82-18390 (20 - 09, p 1208) (NASA-Case-LAR-12868-1; NAS 1.71:LAR-12868-1; US-Patent-4,491,427; US-Patent-Appl-SN-322321; US-Patent-Class-374-208; US-Patent-Class-374-210) Avail: US Patent and Trademark Office CSCL 13I

A reusable metal clamp for retaining a fused quartz ampoule during temperature cycling in the range of 20 deg C to 1000 deg C is described. A compressible graphite foil having a high radial coefficient of thermal expansion is interposed between the fused quartz ampoule and metal clamp to maintain a snug fit between these components at all temperature levels in the cycle. R.J.F.

N85-21652* National Aeronautics and Space Administration. Pasadena Office, Calif.

APPARATUS AND METHOD TO KEEP THE WALLS OF A FREE-SPACE REACTOR FREE FROM DEPOSITS OF SOLID MATERIALS Patent

Kazuo A. Yamakawa, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 19 Feb. 1985 10 p Filed 8 Sep. 1982 Supersedes N83-12986 (21 - 03, p 0455) Sponsored by NASA (NASA-Case-NPO-15851-1; NAS 1.71:NPO-15851-1; US-Patent-4,500,492; US-Patent-Appl-SN-415879; US-Patent-Class-422-199; US-Patent-Class-15-406; US-Patent-Class-134-37; US-Patent-Class-422-129) Avail: US Patent and Trademark Office CSCL 13I

An apparatus and method is disclosed for keeping interior walls of a reaction vessel free of undesirable deposits of solid materials in gas-to-solid reactions. The apparatus includes a movable cleaning head which is configured to be substantially complementary to the interior contour of the walls of the reaction vessel. The head ejects a stream of gas with a relatively high velocity into a narrow space between the head and the walls. The head is moved substantially continuously to at least intermittently blow the stream of gas to substantially the entire surface of the walls wherein undesirable solid deposition is likely to occur. The disclosed apparatus and process is particularly useful for keeping the walls of a free-space silane-gas-to-solid-silicon reactor free of undesirable silicon deposits. R.J.F.

N85-21653 Department of the Air Force, Washington, D.C.

HIGH PRESSURE TURBINE ROTOR TWO-PIECE BLADE RETAINER Patent

R. E. Schlechtweg, inventor (to Air Force) Issued 6 Nov. 1984 6 p Supersedes AD-D010120 (AD-D011498; US-Patent-4,480,958; US-Patent-Appl-SN-465213; US-Patent-Class-416-220) Avail: US Patent and Trademark Office CSCL 13/7

A blade retainer for holding a turbine blade on a turbine rotor disc and sealing a cooling cavity formed between the disc is made up of a two-piece construction. The first piece performs the blade loading function, while the second piece performs the cavity sealing function. The two pieces are attached to the disc by a common set of fasteners, such as bolts. GRA

N85-21654 Department of the Air Force, Washington, D.C.

COOLED TURBINE BLADE TIP CLOSURE Patent

R. L. Horvath and R. W. Harris, inventors (to Air Force) Issued 11 Dec. 1984 6 p Supersedes AD-D010100 (AD-D011525; US-Patent-4,487,550; US-Patent-Appl-SN-461424; US-Patent-Class-416-92) Avail: US Patent and Trademark Office CSCL 13/7

In this patent, an improved high pressure turbine rotor blade and tip cap structure therefore is provided, which comprises, a plurality of metallic layers bonded to the tip end of the blade, each layer having a peripheral shape conforming to the camber of the blade, the layers defining a plurality of radially outwardly opening, serpentine-shaped passageways for passage of coolant fluid through the periphery of the tip end of the blade. GRA

N85-21655 Department of the Air Force, Washington, D.C.

RELEASABLE CABLE CONNECTOR ASSEMBLY FOR USE BETWEEN A MOBILE AND STATIONARY OBJECT Patent

O. V. Fowler, inventor (to Air Force) Issued 25 Dec. 1984 10 p Supersedes AD-D010033 (AD-D011538; US-Patent-4,490,002; US-Patent-Appl-SN-445887; US-Patent-Class-339-45) Avail: US Patent and Trademark Office CSCL 13/5

A cable connector assembly for releasably securing a pair of cable portions of a cable together is described. The cable connector assembly has a stationary housing made up of two outer shell subassemblies, a movable inner shell subassembly slidable within one of the two outer shell subassemblies, and a mounting fixture for securing the stationary subassemblies of a fixed object. One of the cable portions has one end secured to a movable object and the other end secured to the inner shell subassembly. The other cable portion has one end secured to a fixed object and the other end secured to the other of the outer shell assemblies. During normal conditions, the cable portions are securely connected together. Upon the application of a predetermined amount of force to the movable portion of the cable, the inner shell subassembly withdraws from the one outer shell subassembly in order for disconnection of the cable portions to take place in a reliable, safe and efficient manner. GRA

N85-21656 Department of the Air Force, Washington, D.C.

PNEUMATIC CLAMPING DEVICE Patent

B. A. Kosmal and F. W. Auld, inventors (to Air Force) Issued 18 Dec. 1984 6 p Supersedes AD-D010176 (AD-D011544; US-Patent-4,488,713; US-Patent-Appl-SN-475664; US-Patent-Class-269-25) Avail: US Patent and Trademark Office CSCL 13/7

A pneumatic clamping device used to clamp a plurality of sheets together includes a cylinder with a guide element at one end defining a pneumatic chamber within the cylinder and a piston having an elongated shaft, a cylindrical head on one end of the shaft and a clamping foot on an opposite end of the shaft. The piston head is movable within the cylinder chamber, while the piston shaft extends through the guide element and positions the piston foot for insertion through aligned holes in the sheets when the shaft is substantially extended from the cylinder. A coil spring is positioned in the cylinder chamber between one side of the piston head and an end of the cylinder opposite from its one end for biasing the shaft to its extended position. Pressurized air for a source thereof may be supplied to the cylinder chamber at an opposite side of the piston head for overcoming the bias force of the coil spring, resulting in retraction of the piston shaft and clamping of the sheets together between the foot and the cylinder. GRA

N85-21657*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRIBOLOGICAL SYSTEMS AS APPLIED TO AIRCRAFT ENGINES

Donald H. Buckley 26 Apr. 1985 23 p refs To be presented at the 60th AGARD Struct. and Mater. Panel Meeting, San Antonio, 21-26 Apr. 1985 (NASA-TM-86965; E-2478; NAS 1.15:86965) Avail: NTIS

HC A02/MF A01 CSCL 13I

Tribological systems as applied to aircraft are reviewed. The importance of understanding the fundamental concepts involved in such systems is discussed. Basic properties of materials which can be related to adhesion, friction and wear are presented and correlated with tribology. Surface processes including deposition and treatment are addressed in relation to their present and future application to aircraft components such as bearings, gears and seals. Lubrication of components with both liquids and solids is discussed. Advances in both new liquid molecular structures and additives for those structures are reviewed and related to the needs of advanced engines. Solids and polymer composites are suggested for increasing use and ceramic coatings containing fluoride compounds are offered for the extreme temperatures encountered in such components as advanced bearings and seals. M.G.

N85-21658*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LUBRICATION AND PERFORMANCE OF HIGH-SPEED ROLLING-ELEMENT BEARINGS

Erwin V. Zaretsky, Frederick T. Schuller, and Harold H. Coe 1985 19 p refs Proposed for presentation at the 1985 Ann. Meeting of the American Society of Lubrications Engineers, Las Vegas, Nev., 6-9 May 1985

(NASA-TM-86958; E-2362; NAS 1.15:86958) Avail: NTIS HC A02/MF A01 CSCL 13I

Trends in aircraft engine operating speeds have dictated the need for rolling-element bearings capable of speeds to 3 million DN. A review of high-speed rolling-element bearing state-of-the-art performance and lubrication is presented. Through the use of under-race lubrication and bearing thermal management bearing operation can be obtained to speeds of 3 million DN. Jet lubricated ball bearings are limited to 2.5 million DN for large bore sizes and to 3 million DN for small bore sizes. Current computer programs are able to predict bearing thermal performance. Author

N85-21659*# General Research Corp., McLean, Va.

APPLICATIONS OF TETHERS IN SPACE Executive Summary

Alfred C. Cron 1985 69 p Workshop held in Williamsburg, Va., 15-17 Jun. 1983

(Contract NAS8-35408)

(NASA-CP-2366; NAS 1.55:2366) Avail: NTIS HC A04/MF A01 CSCL 22A

The proceedings of the first workshop on applications of tethers in space are summarized. The workshop gathered personalities from industry, academic institutions and government to discuss the relatively new area of applied technology of very long tethers in space to a broad spectrum of future space missions. A large number of tethered concepts and configurations was presented covering electrodynamic interaction tethers, tethered transportation through angular momentum exchange, tethered constellations, low gravity utilization, applicable technology, and tethered test facilities. Specific recommendations were made to NASA in each area. Author

N85-21660*# National Aeronautics and Space Administration, Washington, D. C.

A DEFORMATION ANALYSIS OF FLAT FLEXIBLE GEAR AND ITS EQUATION OF ORIGINAL CURVED SURFACES

Shen Yunwen Feb. 1985 17 p refs Transl. into ENGLISH from Northwestern Polytech. Univ., J. (China), v. 2, Apr. 1984 p 175-185 Original language doc. was announced in IAA as A84-35019 Transl. by Scientific Translation Services, Santa Barbara, Calif.

(Contract NASw-4004)

(NASA-TM-77493; NAS 1.15:77493) Avail: NTIS HC A02/MF A01 CSCL 13I

The equation of the original curved surface of end harmonic gearing is determined by displacement analysis of flat flexible gear. The displacement analysis is also used to calculate the strength and rigidity of the gear. The latter is regarded as a circular plate with two concentrated loads, since its torsional rigidity is much larger than its bending rigidity. Small-deflection theory of thin plates is used to solve for the displacement of any point in the middle plane of the gear. New expressions are given for radial and tangential displacements of the middle plane under asymmetrical loading. A digital computer is used to obtain numerical values for the displacements. Author

N85-21661*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

NASA WELDING ASSESSMENT PROGRAM Final Report

E. J. Stofel Dec. 1984 44 p refs Prepared for JPL, California Inst. of Tech., Pasadena

(Contract NAS7-918)

(NASA-CR-175512; NAS 1.15:175512) Avail: NTIS HC A03/MF A01 CSCL 13H

A long duration test was conducted for comparing various methods of attaching electrical interconnects to solar cells for near Earth orbit spacecraft. Representative solar array modules were thermally cycled for 36,000 cycles between -80 and +80 C. The environmental stress of more than 6 years on a near Earth spacecraft as it cycles in and out of the earth's shadow was simulated. Evaluations of the integrity of these modules were made by visual and by electrical examinations before starting the cycling and then at periodic intervals during the cycling tests. Modules included examples of parallel gap and of ultrasonic welding, as well as soldering. The materials and fabrication processes are state of the art, suitable for forming large solar arrays of spacecraft quality. The modules survived this extensive cycling without detectable degradation in their ability to generate power under sunlight illumination. G.L.C.

N85-21662*# Tuskegee Inst., Ala. Dept. of Mechanical Engineering.

ARC-DRIVEN RAIL GUN RESEARCH Annual Report

Pradosh K. Ray Dec. 1984 69 p refs

(Grant NAG3-76)

(NASA-CR-174816; NAS 1.26:174816) Avail: NTIS HC A04/MF A01 CSCL 14B

The equations describing the performance of an inductively-driven rail gun are analyzed numerically. Friction between the projectile and rails is included through an empirical formulation. The equations are applied to the experiment of Rashleigh and Marshall to obtain an estimate of energy distribution in rail guns as a function of time. The effect of frictional heat dissipation on the bore of the gun is calculated. The mechanism of plasma and projectile acceleration in a dc rail gun is described from a microscopic point of view through the establishment of the Hall field. The plasma conductivity is shown to be a tensor indicating that there is a small component of current parallel to the direction of acceleration. The plasma characteristics are evaluated as a function of plasma mass through a simple fluid mechanical analysis of the plasma. By equating the energy dissipated in the plasma with the radiation heat loss, the properties of the plasma are determined. Author

N85-21663# Aeronautical Research Labs., Melbourne (Australia).

APPLICATIONS OF VIBRATION ANALYSIS TO THE CONDITION MONITORING OF ROLLING ELEMENT BEARINGS

N. S. Swansson and S. C. Favaloro Jan. 1984 90 p refs

(ARL-AERO-PROP-R-163; AR-003-010) Avail: NTIS HC A05/MF A01

Condition monitoring methods for rolling element bearings, which utilize the high frequency vibrations generated by bearing damage, have been investigated and compared experimentally. Kurtosis values, spectra of vibration signal envelopes and pulse measurement methods provided effective detection of early damage, but kurtosis in particular was not effective in evaluating extensive damage, where a combination of methods is required. Comparison of different accelerometer types used as vibration sensors gave very similar results, but an acoustic emission transducer provided indications of incipient damage significantly earlier than the accelerometers. Tests were conducted under reasonably favorable conditions of measurement so further testing

under less favorable conditions is proposed, and the effect of such conditions is briefly considered. G.L.C.

N85-21664# Engineering Development Establishment, Maribyrnong (Australia).
SKID STEERING OF WHEELED AND TRACKED VEHICLES: ANALYSIS WITH COULOMB FRICTION ASSUMPTIONS
A. P. Creedy Dec. 1984 73 p
(AD-A149826; EDE-38/84) Avail: NTIS HC A04/MF A01 CSCL 13/6

Existing theoretical procedures for analysis of skid steering of wheeled and tracked vehicles have been extended to consider the interaction of forces generated for skid steering with the vertical loads carried at each wheel of the vehicle. The developed theory has been organized into a system for numerical calculations of skid steering performance, which has been used to compare the predicted skid steering performance of a 6 x 6 wheeled vehicle, a 8 x 8 wheeled vehicle and a tracked vehicle with 12 road wheels. The results indicated that the wheeled vehicles require greater track speed difference and power input to maintain a steady turn than the tracked vehicle, and that the tracked vehicle can be expected to maintain its ability to steer over a wider range of slope angles and slope heading angles, then the wheeled vehicles. The 8 x 8 wheeled vehicle considered did not appear to offer any significant advantage, in terms of steering performance, over the 6 x 6 vehicle. The results of the slope steerability calculations and, in the case of the 6 x 6 vehicle, comparison of calculated results with experimental data, indicated limitations to the developed theory which require further work to resolve. GRA

N85-21665# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN ORTHOGONAL GRID TECHNIQUE FOR STUDYING INTERNAL DEFORMATION AND ENERGY ABSORPTION IN TARGET PENETRATION
W. J. Bruchey and J. T. Glass Dec. 1984 38 p
(AD-A149989; AD-F300549; BRL-MR-3415) Avail: NTIS HC A03/MF A01 CSCL 19/4

An experimental technique was developed using a split target and internal grid to study material deformation and flow as a result of penetration. Data taken before and after impact show changes in hardness profiles and also the strain distribution within the target. Energy balances equations were developed and showed that over 90% of the incoming energy of the penetrator can be accounted for by the strain energy in the penetrator and target material. GRA

N85-21666# Carnegie-Mellon Univ., Pittsburgh, Pa. Lab. for Autonomous Mobile Robots.
A FUNCTIONAL VEHICLE FOR AUTONOMOUS MOBILE ROBOT RESEARCH Interim Report
Gregg Podnar, Kevin Dowling, and Mike Blackwell Apr. 1984 80 p Sponsored in part by the Office of Naval Research
(AD-A150052; CMU-RI-TR-84-28) Avail: NTIS HC A05/MF A01 CSCL 14/2

Neptune is a tethered vehicle built for autonomous mobile robot research. Included are: the design considerations, the resulting design, and details of the mechanical structure and electrical control system. Detail is sufficient to enable replication or adaptation by others. A discussion of the performance with respect to the design considerations is also included. GRA

N85-21667# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
DYNAMIC VISUAL SERVO CONTROL OF ROBOTS: AN ADAPTIVE IMAGE-BASED APPROACH Interim Report
Lee Elliot Weiss Apr. 1984 277 p Sponsored in part by the Office of Naval Research
(AD-A150057; CMU-RI-TR-84-16) Avail: NTIS HC A13/MF A01 CSCL 06/4

The objective of this dissertation is to develop analytical tools for the design and evaluation of feedback compensators for dynamic vision-based robot control. Sensory systems, such as computer vision, can be used to measure relative robot end-effector (or tool) positions to derive feedback signals for control of end-effector positioning. The role of vision as the feedback transducer affects closed-loop dynamics, and a visual feedback compensator is required. Vision-based robot control research has focused on vision processing issues (e.g., image filtering, structured lighting environments, and image feature interpretation), while control system design has been limited to ad-hoc strategies or linear single degree-of-freedom (DOF) systems. This dissertation formalizes an analytical approach to dynamic robot visual servo control systems by organizing and categorizing visual control strategies into position-based structures and image-based structures. The image-based structure represents a new approach to visual servo control, which uses image features (e.g., image areas, and centroids) as feedback control signals, thus eliminating a complex interpretation step (i.e., interpretation of image features to derive world-space coordinates). This approach also facilities robot task training by a teach-by-showing strategy for specification of the control system reference signal commands. The dissertation includes an in-depth analysis, design, and evaluation of image-based control. Author (GRA)

N85-21668# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
IMPACTS OF ROBOTIC AND FLEXIBLE MANUFACTURING TECHNOLOGIES ON MANUFACTURING COSTS AND EMPLOYMENT Interim Report Ph.D. Thesis
Steven M. Miller Mar. 1984 49 p Sponsored in part by the Office of Naval Research
(Grant NSF PRA-83-02137-826)
(AD-A150060; CMU-RI-TR-84-23) Avail: NTIS HC A03/MF A01 CSCL 13/8

The issues analyzed in this paper are the extent to which unit costs and production labor requirements might be reduced in manufacturing industries if there were more widespread use of industrial robots and flexible manufacturing systems. These issues are analyzed from two perspectives. The technological focus of the first perspective is confined to the use of robotic manipulators. The percent of the production worker jobs that could be replaced by robots is estimated. Reductions in unit cost are calculated by assuming that a given precentage of labor costs is reduced. The technological focus of the second perspective is the integration of robots with other types of computer assisted manufacturing technologies into flexible manufacturing systems. Potential increase in output that could be realized in low-, medium-, and high-volume plants, if machines were fully utilized, is estimated. Based on an analysis of a large cross section of metalworking industries, a relationship is specified between the level of output and the level of unit cost. Using these results, potential reductions in unit cost for low-, medium-, and high-volume plants are estimated. GRA

N85-21669# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
MECHANICAL PROPERTIES FOR THE GRASP OF A ROBOTIC HAND Interim Report
Mark R. Cutkosky Sep. 1984 86 p Sponsored in part by the Office of Naval Research
(AD-A150062; CMU-RI-TR-84-24) Avail: NTIS HC A05/MF A01 CSCL 13/9

The subject of this paper forms part of a broader effort to model the mechanics of grasping and fine-manipulation for robots. Grasping is the act of acquiring and holding (gripping) an object. Fine-manipulation is an extension of grasping to include control of the object using an end-effector such as a gripper or a hand. A mechanical model of grasping and manipulation forms the basis for controlling grippers and paves the way for robots that can make independent judgments about how to pick up and handle the objects they encounter. In this paper a procedure is developed for computing physical properties with which a grasp may be described. Among these properties are grip strength, stability, compliance and mobility. The results depend strongly on the interaction between the gripping surfaces and the object. For example, a grasp may be unstable when the fingertips are pointed,

but stable for rounded fingertips. The analysis suggests that particular kinds of sensory information are especially useful in controlling a grasp and supports the notion that general grasping rules of thumb can be identified for use by robots. GRA

N85-21670# Idaho National Engineering Lab., Idaho Falls. Materials Science Div.
CHARACTERIZATION OF THE HEAT SOURCE DISTRIBUTION OF A TYPICAL GTAW WELDING ARC
M. E. McIlwain, H. B. Smartt, J. A. Stewart, and C. J. Einerson 1984 5 p refs Presented at the 7th Intern. Soc. for Optical Eng. Meeting on Thermosense, Cambridge, Mass., 5 Nov. 1984 (Contract DE-AC07-76ID-01570)
(DE85-004322; EGG-M-24784; CONF-8411120-4) Avail: NTIS HC A02/MF A01

Understanding the influence of fundamental welding parameters on the distribution of the heat flux on the weld and the resulting weld bead morphology has become increasingly important with the escalating emphasis on automated control of the welding process. The arc heat source distribution at the work piece was studied using the underside infrared signature. Arcs were struck on a thin anode section ranging from 0.5 to 2 mm in thickness. Results from both experiments and calculations suggest that the arc heat input can be radily characterized using the IR thermogram. In addition, other properties such as weld pool cooling characteristics and solidification processes can be determined using this method. DOE

N85-21671# Vineta, Inc., Falls Church, Va.
CLOSED CYCLE VERSUS OPEN CYCLE GAS TURBINES. A REVIEW OF A.D. LITTLE'S ICOP REPORT, VOL. 3
24 Aug. 1984 52 p
(Contract DE-AC01-81CS-40403)
(DE85-000564; DOE/CS-40403/T1) Avail: NTIS HC A04/MF A01

The question of how coal fired closed cycle gas turbine cogenerators perform economically in comparison to coal fired open cycle gas turbine configurations is addressed. The return on equity (ROE) was selected as a measure of economic performance. The investigations determined attainable ROE's for three industries (agrichemical products, brewery, paper mill) for closed and open configurations as proposed in a report on the Industrial Cogeneration Optimization Program. Life cycle analyses were conducted assessing the impact of various parameters upon the rank-ordering of ROE's for the four topping configurations (one closed cycle, three open cycle gas turbines). DOE

N85-21672# Kloecker-Werke A.G., Bremen (West Germany). Kloeckner Stahlforschung.
NEW APPLICATION POSSIBILITIES FOR CLAD STEEL BY REDUCING SURFACE TREATMENT EXPENDITURE AND BY USING IMPROVED WELDING TECHNOLOGY Final Report, Dec. 1983
Hans-Juergen Langhammer and Franz Jargon Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 47 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-236; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

Pickling, cold rolling, annealing, and mechanical treatments were adapted for clad flat products. Pickling, rolling on a four-stand tandem mill, annealing in hood-type furnaces, and grinding allows significant cost savings compared to conventional production. It is proven that resistance fusion welding and fusion welding are suitable for clad steels. The cutting edges were protected by folding, flanging, and flame spraying. Application possibilities for clad steels with reduced surface treatment expenditure in architecture, energy, and offshore technology are presented. Single-sided clad strips with high grade alloy materials (ferrite-austenitic steels) for the bearing surface show hopeful results for this product as construction material for sourgas pipelines and hard substance transport containers. Author (ESA)

N85-22210*# Auburn Univ., Ala. Dept. of Computer Science.
SINGULAR ASYMPTOTIC EXPANSIONS IN NONLINEAR ROTOR DYNAMICS
William B. Day *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24 p refs Previously announced as N85-10100 (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 13K

N85-22233*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
SENSOR CONTROL OF ROBOT ARC WELDING
Fred R. Sias, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 91p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 13H

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-21673*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
APPLICATION OF HOMOMORPHIC SIGNAL PROCESSING TO STRESS WAVE FACTOR ANALYSIS
Hira Karagulla, James H. Williams, Jr., and Sampson S. Lee Feb. 1985 48 p refs
(Grant NsG-3328)
Avail: NTIS HC A03/MF A01 CSCL 14D

The stress wave factor (SWF) signal, which is the output of an ultrasonic testing system where the transmitting and receiving transducers are coupled to the same face of the test structure, is analyzed in the frequency domain. The SWF signal generated in an isotropic elastic plate is modelled as the superposition of successive reflections. The reflection which is generated by the stress waves which travel p times as a longitudinal (P) wave and s times as a shear (S) wave through the plate while reflecting back and forth between the bottom and top faces of the plate is designated as the reflection with p, s. Short-time portions of the SWF signal are considered for obtaining spectral information on individual reflections. If the significant reflections are not overlapped, the short-time Fourier analysis is used. A summary of the elevant points of homomorphic signal processing, which is also called cepstrum analysis, is given. Homomorphic signal processing is applied to short-time SWF signals to obtain estimates of the log spectra of individual reflections for cases in which the reflections are overlapped. Two typical SWF signals generated in aluminum plates (overlapping and non-overlapping reflections) are analyzed. M.G.

N85-21674*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIOGRAPHIC DETECTABILITY LIMITS FOR SEEDED VOIDS IN SINTERED SILICON CARBIDE AND SILICON NITRIDE
George Y. Baaklini (Cleveland State Univ.), James D. Kiser, and Don J. Roth 1984 19 p refs Presented at the Regional Meeting of the American Ceramic Society, San Francisco, 28-31 Oct. 1984
(NASA-TM-86945; E-2464; NAS 1.15:86945) Avail: NTIS HC A02/MF A01 CSCL 14D

Conventional and microfocus X-radiographic techniques were compared to determine relative detectability limits for voids in green and sintered SiC and Si3N4. The relative sensitivity of the techniques was evaluated by comparing their ability to detect voids that were artificially introduced by a seeding process. For projection microfocus radiography the sensitivity of void detection at a 90/95 probability of detection/confidence level is 1.5% of specimen thickness in sintered SiC and Si3N4. For conventional contact radiography the sensitivity is 2.5% of specimen thickness.

It appears that microfocus projection radiography is preferable to conventional contact radiography in cases where increased sensitivity is required and where the additional complexity of the technique can be tolerated. E.A.K.

N85-21675*# Webb, Murray and Associates, Inc., Houston, Tex.
TEST RESULTS FROM A COMPARATIVE EVALUATION OF A CONDENSATION NUCLEI FIRE DETECTOR Final Report
Richard W. Bricker Washington NASA Mar. 1985 61 p
(Contract NAS9-15980)
(NASA-CR-3874; S-543; NAS 1.26:3874) Avail: NTIS HC A04/MF A01 CSCL 13L

The fire/smoke alarm response of a condensation nuclei fire detector (CNFD) was compared with photoelectric and ionization detectors. Tests were conducted in a former control room 8.5 m by 8.9 with a 2.7 m ceiling. The room had air supplied from above the ceiling and under the floor with return air exiting from ceiling grills. The environment was varied from 278 to 305 K and relative humidities from 8 to 65%. Four detection zones were located in the room. Each zone contained a sampling head for the CNDF, a photodetector, and an ionization detector so that each detector system had four opportunities to alarm during tests. The particle level in the test room was also monitored during tests with a condensation nuclei particle counter. The CNFD responded to 90% of exposures to smoldering plastic and 84% of exposures to visible fire. The photoelectric response was 43 and 12.5% respectively for the same conditions. The ionization response was 9 and 48 respectively. E.A.K.

N85-21676# Aeronautical Research Labs., Melbourne (Australia).
FINITE ELEMENT ANALYSIS OF PROBLEMS ASSOCIATED WITH LIFE ENHANCEMENT TECHNIQUES
M. Heller, J. Paul, R. P. Carey, and R. Jones 1984 20 p refs
(ARL-STRUC-R-404; AR-003-929) Avail: NTIS HC A02/MF A01

Fatigue life enhancement systems such as interference-fit fasteners and cold-expanded holes, are assuming increasing importance for aircraft structures. A penalty finite-element method is formulated for the stress analysis of these common fatigue life enhancement systems. The method is demonstrated by considering two illustrative examples under elastic, plane-stress conditions. The three-dimensional analysis of a uniformly pressurized hole in a plate is also discussed with reference to cold-expanded holes. Author

N85-21677# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A NOTE ON SOME SIMPLE INFLUENCE DIAGNOSTICS IN ACCELERATED LIFE TESTING
H. Schneider, L. Weissfeld, and R. J. Carroll Oct. 1984 30 p
(Contract F49620-82-C-0009)
(AD-A149593; MIMEO-SER-1562; AFOSR-84-1203TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Three methods for assessing influence in an accelerated life-testing model are considered; two different one-step approximations to the estimated parameter after case deletion and a method which treats extreme values at each design point is censored. These methods are compared using an example. Problems which occur when all observations at a design point are censored are discussed. Author (GRA)

N85-21678# Advanced Research and Applications Corp., Sunnyvale, Calif.
A NEW NDE (NON-DESTRUCTIVE EVALUATION) CAPABILITY FOR THIN-SHELLED STRUCTURES Final Report, Oct. 1983 - Apr. 1984
J. H. Stanley, J. L. Chambers, and M. J. Boyle Wright-Patterson AFB, Ohio AFWAL Sep. 1984 50 p
(Contract F33615-83-C-5108)
(AD-A149625; ARACOR-FR-84-246-1; AFWAL-TR-84-4120) Avail: NTIS HC A03/MF A01 CSCL 14/2

A new imaging modality suited for thin-shelled structures was evaluated for feasibility during Phase 1. The approach is based on well-established digital tomosynthesis principles and modern real-time digital radiography techniques. A series of component radiographs of a structure taken from many different angles are manipulated according to a restorative algorithm to recover a set of images of parallel surfaces within and concentric to the natural shape of the object. Consequently, the proposed instrument, which has been designated a Digital Tomograph (DT), is tailored for non-destructively evaluating structures which are fabricated in a laminar or multilayer fashion. A Phase 2 program to develop and demonstrate a pre-prototype scanner is proposed based on the Phase 1 conceptual design. The preprototype DT system, with full imaging capabilities, although limited throughput capability, will be compatible with Phase 3 prototype commercialization. Author (GRA)

N85-21679# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
THE STATE OF THE ART IN PRINTED WIRING BOARD INSPECTION Interim Technical Report
R. Thibadeau Nov. 1984 19 p
(AD-A149871; CMU-RI-TR-84-25) Avail: NTIS HC A02/MF A01 CSCL 14/2

Automated visual inspection of printed wiring is providing research opportunities in completely automated optical systems technology. This paper addresses device design considerations, particularly the important problem of turning an optical inspection device into a tool for manufacturing process analysis and control. GRA

N85-21680# Stanford Univ., Calif.
ON MAXIMIZING THE EXPECTED LIFETIME OF REPLACEABLE SYSTEMS
M. M. Perkins Dec. 1984 80 p
(Contract N00014-84-K-0244)
(AD-A150003; TR-213) Avail: NTIS HC A05/MF A01 CSCL 15/5

Consider the following model. A system has one vital component with n spares. When the vital component fails, the system fails. Derman, Lieberman, and Ross have considered the problem of maximizing the time until failure of the system. They obtained optimal schedules when the lifetime distributions of the spares were known. This paper treats several different cases of this model and finds optimal schedules together with their properties. Assuming only the first two moments of the spare component lifetime distributions are known, the minimax replacement schedules is obtained. These minimax replacement schedules are then compared with schedules based on different amounts of information. When the spares are different from each other, it must be decided in which order they should be used. A general sufficient condition is given under which the greedy order is maximal. This condition applies when the complete lifetime distribution is known, or for any minimax schedule. Two special cases are also considered. The first is the case in which groups of spares may be used in parallel. In the second special case, an additional spare will become available at some future time. Author (GRA)

N85-21681# California Univ., Livermore. Lawrence Livermore Lab.
NONDESTRUCTIVE METHOD FOR DETECTING MACHINE DAMAGE IN BERYLLIUM
R. D. Weglein, J. E. Hanafee, and S. E. Benson 6 Jul. 1984 11 p refs Presented at Progr. in Quant. NDE, San Diego, Calif., 8 Jul. 1984
(Contract W-7405-eng-48)
(DE85-001074; UCRL-90743; CONF-840738-8) Avail: NTIS HC A02/MF A01

Machining damage (MD) was detected and characterized in the acoustic microscope via the acoustic material signature (AMS) technique. This technique permits the easy measurement of surface acoustic wave (SAW) dispersion that is produced by machining damage in beryllium. Approximately 3% SAW velocity reduction as compared to the undamaged substrate was observed at 35 MHz. The damaged layer is approximately 25 microns deep as estimated from metallurgically prepared cross-sectional views.

Nondestructive machining-damage assesment by AMS is discussed with extension to depth profiling over a wide frequency range.
DOE

N85-21682# Technical Research Centre of Finland, Espoo. Saehkoetekniikan Lab.
RELIABILITY ANALYSIS OF AUTOMATIC SYSTEMS [AUTOMAATIOJAERJESTELMIEN KAEYTTOEVARMUUSANALYSSI]
Ilkka Niemelae and Hannu Hossi Aug. 1984 52 p refs In FINNISH
(VTT-301; ISBN-951-38-2127-7; ISSN-0358-5077) Avail: NTIS HC A04/MF A01

A computerized method for investigating and analyzing the reliability of large, decentralized, hierarchical automatic systems was developed. It can also be used to analyze static, task-oriented systems. The automatic system is dynamically divided into different control tasks consisting of one or several control circuits. Algorithms to create the operation network and to search for minimum cut sets were derived. Calculations of reliability, availability, and component critical values are based on minimal cut sets obtained from the system. Author (ESA)

N85-21683# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
DEFECT CHARACTERISATION AND MONITORING BY ACOUSTIC EMISSION
C. B. Scruby Oct. 1984 17 p refs
(AERE-R-11409) Avail: Issuing Activity

Methods exist for quantifying the defect growth by analyzing the measured elastic wavefield. The application of acoustic source characterization technique to the growth of a crack in 7010 aluminum alloy under cyclic fatigue is presented. Finally, the application of this quantitative approach to the NDE of materials and structures is discussed. G.L.C.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-21684 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
SYMMETRIC PRIMAL-DUAL VARIATIONAL FORMULATIONS OF COUPLED DYNAMIC SYSTEMS: THREE-DIMENSIONAL ELASTICITY, SHELLS, FLUID-STRUCTURE INTERACTION
R. Ohayon and R. Valid 1983 10 p refs Presented at the 7th Intern. Conf. on Structural Mechanics in Reactor Technol., Chicago, 22-26 Aug. 1983
(ONERA-1983-91) Avail: NTIS HC A02/MF A01

A theory and a methodology are presented for the coupling of domains where primal displacement and dual stress variational formulations are used respectively, in order to obtain a symmetric variational formulation for the linear transient or model analysis of coupled systems. This is done by using an auxiliary field variable in the region where the dual stress analysis is carried out, leading, in this region, to a new dynamic mixed variational formulation. Generalized so-called added mass operators are also introduced in order to eliminate afterwards, in many cases, the auxiliary field variable. The methodology is described for three-dimensional elasticity and shell problems. Compressible fluid-structure interaction in bounded medium is presented as a particular case of elastic problems. G.L.C.

N85-21685*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Civil Engineering.
TRANSLATIONAL AND EXTENSIONAL ENERGY RELEASE RATES (THE J- AND M-INTEGRALS) FOR A CRACK LAYER IN THERMOELASTICITY Final Report
A. Chudnovsky and B. Gommerstadt Mar. 1985 9 p refs
(Grant NAG3-223)
(NASA-CR-174872; NAS 1.26:174872) Avail: NTIS HC A02/MF A01 CSCL 20K

A number of papers have been presented on the evaluation of energy release rate for thermoelasticity and corresponding J integral. Two main approaches were developed to treat energy release rate in elasticity. The first is based on direct calculation of the potential energy rate with respect to crack length. The second makes use of Lagrangian formalism. The translational and expansional energy release rates in thermoelasticity are studied by employing the formalism of irreversible thermodynamics and the Crack Layer Approach. Author

N85-21686*# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
3-D INELASTIC ANALYSIS METHODS FOR HOT SECTION COMPONENTS (BASE PROGRAM) Annual Status Report, 14 Feb. 1983 - 14 Feb. 1984
R. B. Wilson, M. J. Bak, S. Nakazawa, and P. K. Banerjee Feb. 1984 167 p refs
(Contract NAS3-23697)
(NASA-CR-174700; NAS 1.26:174700; PWA-5940-19; ASR-1) Avail: NTIS HC A08/MF A01 CSCL 20K

A 3-D inelastic analysis methods program consists of a series of computer codes embodying a progression of mathematical models (mechanics of materials, special finite element, boundary element) for streamlined analysis of combustor liners, turbine blades, and turbine vanes. These models address the effects of high temperatures and thermal/mechanical loadings on the local (stress/strain) and global (dynamics, buckling) structural behavior of the three selected components. These models are used to solve 3-D inelastic problems using linear approximations in the sense that stresses/strains and temperatures in generic modeling regions are linear functions of the spatial coordinates, and solution increments for load, temperature and/or time are extrapolated linearly from previous information. Three linear formulation computer codes, referred to as MOMM (Mechanics of Materials Model), MHOST (MARC-Hot Section Technology), and BEST (Boundary Element Stress Technology), were developed and are described. Author

N85-21687*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
RECENT ADVANCES IN HYBRID/MIXED FINITE ELEMENTS
Theodore H. H. Pian [1985] 8 p refs
(Grant NAG3-33)
(NASA-CR-175574; NAS 1.26:175574) Avail: NTIS HC A02/MF A01 CSCL 20K

In formulations of Hybrid/Mixed finite element methods respectively by the Hellinger-Reissner principle and the Hu-Washizu principle, the stress equilibrium equations are brought in as conditions of constraint through the introduction of additional internal displacement parameters. These two approaches are more flexible and have better computing efficiencies. A procedure for the choice of assumed stress terms for 3-D solids is suggested. Example solutions are given for plates and shells using the present formulations and the idea of semiloof elements. Author

N85-21688# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
THE EFFECT OF AN ELASTIC FOUNDATION AND OF DISSIPATIVE FORCES ON THE STABILITY OF FLUID CONVEYING PIPES
I. Lottati and A. Kornecki Feb. 1985 44 p refs
(TAE-563) Avail: NTIS HC A03/MF A01

A theoretical analysis is presented of the effect of an elastic foundation and various damping forces on the stability of fluid conveying pipes. Both cantilevered pipes and pipes supported at both ends are considered. The results of extensive numerical calculations are presented in the form of diagrams and compared with other known results and with some approximate calculations. Author

N85-21689*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPLORATORY FLUTTER TEST IN A CRYOGENIC WIND TUNNEL
Stanley R. Cole Feb. 1985 11 p refs Presented at the AIAA/ASME/ASCE/AHS 26th SDM Conf., Orlando, Fla., 15-17 Apr. 1985
(NASA-TM-86380; NAS 1.15:86380) Avail: NTIS HC A02/MF A01 CSCL 20K

A model consisting of a rigid wing with an integral, flexible beam support that was cantilever mounted from the wall in the NASA LaRC 0.3-m transonic cryogenic tunnel was used in a flutter analysis study. The wing had a rectangular planform of aspect ratio 1.5 and a 64A010 airfoil. Various considerations and procedures for conducting flutter tests in a cryogenic wind tunnel were evaluated. Flutter onset conditions were established from extrapolated subcritical response measurements. A flutter boundary was determined at cryogenic temperatures over a Mach number M range from 0.5 to 0.9. Flutter was obtained at two different Reynolds numbers R at M = 0.5 (R = 4.4 and 18.4 x 10 to the 6th power) and at M = 0.8 (R = 5.0 and 10.4 x 10 to the 6th power). Flutter analyses using subsonic lifting surface (kernel function) aerodynamics were made over the range of test conditions. To evaluate the Reynolds number effects at M = 0.5 and 0.8, the experimental results were adjusted using analytical trends to account for differences in the model test temperatures and mass ratios. The adjusted experimental results indicate that increasing Reynolds number from 5.0 to 20.0 x 10 to the 6th power decreased the dynamic pressure by 4.0 to 6.5 percent at M = 0.5 and 0.8. A.R.H.

N85-21690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON LOCAL TOTAL STRAIN REDISTRIBUTION USING A SIMPLIFIED CYCLIC INELASTIC ANALYSIS BASED ON AN ELASTIC SOLUTION
Shoi Y. Hwang (South Carolina State Coll.) and Albert Kaufman 1985 16 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 9-11 Jul. 1985; sponsored by the AIAA, SAE and ASME
(NASA-TM-86913; E-2406; NAS 1.15:86913) Avail: NTIS HC A02/MF A01 CSCL 20K

Strain redistribution corrections were developed for a simplified inelastic analysis procedure to economically calculate material cyclic response at the critical location of a structure for life prediction purposes. The method was based on the assumption that the plastic region in the structure is local and the total strain history required for input can be defined from elastic finite element analyses. Cyclic stress-strain behavior was represented by a bilinear kinematic hardening model. The simplified procedure has been found to predict stress-strain response with reasonable accuracy for thermally cycled problems but needs improvement for mechanically load cycled problems. This study derived and incorporated Neuber type corrections in the simplified procedure to account for local total strain redistribution under cyclic mechanical loading. The corrected simplified method was exercised on a mechanically load cycled benchmark notched plate problem. Excellent agreement was found between the predicted material response and nonlinear finite element solutions for the problem. The simplified analysis computer program used 0.3 percent of the CPU time required for a nonlinear finite element analysis. Author

N85-21691*# Akron Univ., Ohio. Dept. of Civil Engineering.
VISCOPLASTIC CONSTITUTIVE RELATIONSHIPS WITH DEPENDENCE ON THERMOMECHANICAL HISTORY Final Report
D. N. Robinson and P. A. Bartolotta Mar. 1985 42 p refs
(Grant NAG3-379)
(NASA-CR-174836; NAS 1.26:174836) Avail: NTIS HC A03/MF A01 CSCL 20K

Experimental evidence of thermomechanical history dependence in the cyclic hardening behavior of some common high-temperature structural alloys is presented with special emphasis on dynamic metallurgical changes. The inadequacy of formulating nonisothermal constitutive equations solely on the basis of isothermal testing is discussed. A representation of thermoviscoplasticity is proposed that qualitatively accounts for the observed hereditary behavior. This is achieved by formulating the scalar evolutionary equation in an established viscoplasticity theory to reflect thermomechanical path dependence. To assess the importance of accounting for thermomechanical history dependence in practical structural analyses, two qualitative models are specified: (1) formulated as if based entirely on isothermal information; (2) to reflect thermomechanical path dependence using the proposed thermoviscoplastic representation. Predictions of the two models are compared and the impact the calculated differences in deformation behavior may have on subsequent lifetime predictions is discussed. E.A.K.

N85-21692*# Lehigh Univ., Bethlehem, Pa.
INTERACTION OF PART-THROUGH CRACKS IN A FLAT PLATE
B. Aksel and F. Erdogan Apr. 1985 114 p refs
(Grant NGR39-007-011)
(NASA-CR-175588; NAS 1.26:175588) Avail: NTIS HC A06/MF A01 CSCL 20K

The accuracy of the line spring model is determined. The effect of interaction between two and three cracks is investigated, and extensive numerical results which may be useful in applications are provided. Line spring model with Reissner's plate theory is formulated to be used for any number and configurations of cracks provided that there is symmetry. This model is used to find stress intensity factors for elliptic internal cracks, elliptic edge cracks and two opposite elliptic edge cracks. Despite the simplicity of the line spring model, the results are found to be close. Author

N85-21693*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
PLANAR DYNAMICS OF A UNIFORM BEAM WITH RIGID BODIES AFFIXED TO THE ENDS
Joel Storch and Stephen Gates May 1983 96 p refs
(Contract NAS9-16023)
(NASA-CR-175566; NAS 1.26:175566; CSDL-R-1629) Avail: NTIS HC A05/MF A01 CSCL 20K

The planar dynamics of a uniform elastic beam subject to a variety of geometric and natural boundary conditions and external excitations were analyzed. The beams are inextensible and capable of small transverse bending deformations only. Classical beam vibration eigenvalue problems for a cantilever with tip mass, a cantilever with tip body and an unconstrained beam with rigid bodies at each are examined. The characteristic equations, eigenfunctions and orthogonality relations for each are derived. The forced vibration of a cantilever with tip body subject to base acceleration is analyzed. The exact solution of the governing nonhomogeneous partial differential equation with time dependent boundary conditions is presented and compared with a Rayleigh-Ritz approximate solution. The arbitrary planar motion of an elastic beam with rigid bodies at the ends is addressed. Equations of motion are derived for two modal expansions of the beam deflection. The motion equations are cast in a first order form suitable for numerical integration. Selected FORTRAN programs are provided. E.A.K.

N85-21694*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
TRANSVERSE VIBRATION AND BUCKLING OF A CANTILEVERED BEAM WITH TIP BODY UNDER CONSTANT AXIAL BASE ACCELERATION
Joel Storch and Stephen Gates Oct. 1983 65 p refs
(Contract NAS9-16023)
(NASA-CR-175567; NAS 1.26:175567; CSDL-R-1675) Avail: NTIS HC A04/MF A01 CSCL 20K

The planar transverse bending behavior of a uniform cantilevered beam with rigid tip body subject to constant axial base acceleration was analyzed. The beam is inextensible and capable of small elastic transverse bending deformations only. Two classes of tip bodies are recognized: (1) mass centers located along the beam tip tangent line; and (2) mass centers with arbitrary offset

towards the beam attachment point. The steady state response is studied for the beam end condition cases: free, tip mass, tip body with restricted mass center offset, and tip body with arbitrary mass center offset. The first three cases constitute classical Euler buckling problems, and the characteristic equation for the critical loads/accelerations are determined. For the last case a unique steady state solution exists. The free vibration response is examined for the two classes of tip body. The characteristic equation, eigenfunctions and their orthogonality properties are obtained for the case of restricted mass center offset. The vibration problem is nonhomogeneous for the case of arbitrary mass center offset. The exact solution is obtained as a sum of the steady state solution and a superposition of simple harmonic motions. E.A.K.

N85-21695*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL SENSITIVITY ANALYSIS: METHODS, APPLICATIONS AND NEEDS
Howard M. Adelman, Raphael T. Haftka (Virginia Polytechnic Inst. and State Univ., Blacksburg), Charle J. Camarda, and Joanne L. Walsh Jun. 1948 19 p refs Presented at Symp. on Recent Experiences in Multidisciplinary Analysis and Optimization, 24-26 Apr. 1984, Hampton, Va.
(NASA-TM-85827; NAS 1.15:85827) Avail: NTIS HC A02/MF A01 CSCL 20K

Innovative techniques applicable to sensitivity analysis of discretized structural systems are reviewed. The techniques include a finite difference step size selection algorithm, a method for derivatives of iterative solutions, a Green's function technique for derivatives of transient response, simultaneous calculation of temperatures and their derivatives, derivatives with respect to shape, and derivatives of optimum designs with respect to problem parameters. Computerized implementations of sensitivity analysis and applications of sensitivity derivatives are also discussed. Some of the critical needs in the structural sensitivity area are indicated along with plans for dealing with some of those needs. E.A.K.

N85-21696# National Research Council of Canada, Ottawa (Ontario).
TIME MARCHING NUMERICAL SOLUTION OF THE DYNAMIC RESPONSE OF NONLINEAR SYSTEMS
D. J. Jones and B. H. K. Lee Jan. 1985 40 p refs
(NAF-AN-25; NRC-24131) Avail: NTIS HC A03/MF A01

As part of the study of the nonlinear response of structural components, a single degree of freedom nonlinear response equation usually known as Duffing's equation is investigated. Previously the response curves have been investigated analytically by many authors but there seems to have been very little numerical work done in the nonlinear cases. It is shown that a numerical solution is feasible and that some of the standard analytical approximations are not accurate in the peak region of the response curve. B.W.

N85-21697# Institute of Space and Astronautical Science, Tokyo (Japan).
VARIABLE GEOMETRY TRUSS CONCEPT
Koryo Miura Sep. 1984 20 p refs
(Rept-614; ISSN-0285-6808) Avail: NTIS HC A02/MF A01

A concept for a one-dimensional deployable truss structure is presented. The deployed configuration of the structure consists of the repetition of an octahedral truss module longitudinally, and thus it is exactly the so-called geodesic beam structure. The principal mechanical feature of the truss is that the lateral members comprising the lateral triangular truss are telescoping beams. Contracting of the lateral members results in the deployment of the truss structure. The geometric transformation of this truss of variable geometry is presented. It is shown that both simultaneous and sequential modes of transformation are possible. The validity of the transformation applied to the deployment is verified through design of a conceptual model. The applications of the concept to a curvilinear truss and a space manipulator arm are previewed. Author

N85-21698# Aeronautical Research Labs., Melbourne (Australia).
ON THE STRESS ANALYSIS OF BONDED INSERTS
R. Jones and M. Heller 1984 22 p refs
(ARL-Struc-R-407; AR-003-941) Avail: NTIS HC A02/MF A01

Recent experimental work has shown that adhesively bonded inserts can significantly increase the fatigue life of fastener holes. The mechanisms which give rise to the observed increase in life are examined. Cracked as well as uncracked fastener holes are considered. It is shown that both the stress concentration factors, and the stress intensity factors are significantly reduced by the use of other bonded rivets or bonded sleeves. It is also shown that the stress intensity factor, for a cracked hole repaired by a bonded insert, can be obtained by analogy with readily available solutions. B.W.

N85-21699# Aeronautical Research Labs., Melbourne (Australia).
THE RESIDUAL STRENGTH OF CRACKED SPECIMENS REPRESENTING A SECTION OF THE MIRAGE INTO WING MAIN SPAR
A. S. Machin 1984 48 p refs
(ARL-Struc-R-408; ARL-003-942) Avail: NTIS HC A03/MF A01

The discovery of fatigue cracks at bolt holes in the wing main spar of many RAAF Mirage 30O aircraft prompted an investigation into the residual strength of cracked specimens representing the critical section of the spar. Fatigue cracks were grown at the bolt holes of these specimens, which were frequently inspected to monitor the crack length. The specimens were then broken in static tension, the fracture surfaces photographed and the lengths, depths and areas of the fatigue cracks measured. Using only the data available from the nondestructive inspection made just prior to the static failure it was not possible to predict accurately the specimen residual strength though it was possible to estimate a lower bound. Crack lengths, as estimated by the NDI technique used, were close to the measured crack lengths, though usually greater. Using the measured crack lengths, depths and areas it was not possible to predict accurately specimen residual strengths, though results were better than if information obtained only by NDI were used. Fracture mechanics techniques could not be used to predict residual strengths because of a lack of suitable stress intensity factor solutions. Author

N85-21700# Aeronautical Research Labs., Melbourne (Australia).
STRESSES IN A HALF-PLANE CONTAINING EITHER A PRESSURIZED HOLE OR AN INTERFERENCE-FIT DISC
G. S. Jost 1984 21 p refs
(ARL-Struc-R-409; AR-003-943) Avail: NTIS HC A02/MF A01

Comparisons are made of the theoretical stresses in a half-plane containing either a pressurized hole or an interference-fit disc. For a hole more than about three radii from the free edge the differences between the two cases become progressively more insignificant. Author

N85-21701# Aeronautical Research Labs., Melbourne (Australia).
ELASTIC RESPONSE OF A HALF-PLANE TO A BONDED INTERFERENCE-FIT DISC OF THE SAME MATERIAL
G. S. Jost and R. P. Carey 1984 30 p refs
(ARL-Struc-R-406; AR-003-940) Avail: NTIS HC A03/MF A01

Analytical expressions for the stress and displacement fields in a half-plane containing a bonded interference-fit disc of the same material are enunciated. Some representative geometric configurations are evaluated, the results being given in both tabular and graphical forms. Author

N85-21702# Naval Civil Engineering Lab., Port Hueneme, Calif.
A STUDY OF COUPLING THE BOUNDARY AND FINITE ELEMENT METHODS IN TWO-DIMENSIONAL ELASTOSTATICS Report, Oct. 1982 - Sep. 1983
T. A. Shugar and J. V. Cox Oct. 1984 73 p
(ZR0-0001)
(AD-A149619; NCEL-TN-1710) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report investigates the potential advantage of a combined boundary element-finite element solution approach by

examining the behavior of coupled elastostatic domains. A theoretical investigation of coupling the displacement-based finite element method with the indirect boundary element method was conducted and the results were implemented within a microcomputer framework. It is believed that a combined finite element and boundary element computer program could reduce the high cost now associated with nonlinear finite element programs, but it is shown that further work is needed to make the boundary element method more effective. A quadratic, isoparametric boundary element, which would allow a better evaluation of accuracy and cost in the solution of coupled elastostatic problems, should be investigated. GRA

N85-21703# Army Construction Engineering Research Lab., Champaign, Ill.
DEVELOPMENT AND EVALUATION OF A PROCEDURE FOR THE RAPID ANALYSIS OF FRESH CONCRETE Final Technical Report
W. J. Head, H. M. Phillippi, and D. J. Lawrence Dec. 1984 113 p
(AD-A149741; CERL-TR-M-85/08) Avail: NTIS HC A06/MF A01 CSCL 13/3

Three generations of the procedure were considered: Generation 1: the original Kelly-Vail (KV) method developed by R. T. Kelly and J. W. Vail of the Greater London Council. Generation 2: the CERL/KV method, developed by the U.S. Army Construction Engineering Research Laboratory (CERL). Generation 3: the Corps of Engineers Concrete Quality Monitor (CE/CQM), also developed by CERL. The abilities of Generation 2 and 3 methods to help predict cement and water contents of a variety of concrete mixtures were determined in an extensive series of side-by-side laboratory tests. The tests evaluated the effects of sampling techniques and aggregate type. Variance techniques were analyzed to help establish accuracy statements and to compare the two methods and the utility of these methods as bases for predicting concrete compressive and flexure strength was assessed. Also, field and additional laboratory tests of the Generation 3 method were conducted to determine: (1) how the Generation 3 method performed under field conditions, and (2) the effects of selected common admixtures on the output of the chloride meter used in the Generation 3 method. The results demonstrated that the accuracies of Generations 2 and 3 were equivalent for identical test conditions and that aggregate characteristics affect the results of both cement content tests and both water content tests. It was also determined that actual water/cement ratios and water/cement ratios predicted on the bases of these methods may be used with equal accuracy for estimating 28-day concrete strength. GRA

N85-21704# Maryland Univ., College Park. Lab. for Numerical Analysis.
A NEW MODEL FOR THIN PLATES WITH RAPIDLY VARYING THICKNESS. PART 3: COMPARISON OF DIFFERENT SCALINGS Final Report
R. V. Kohn (New York Univ., N.Y.) and M. Vogelius Nov. 1984 29 p 3 Vol.
(Contracts N00014-77-C-0623; N00014-83-K-0536; Grants NSF MCS-82-01308; NSF DMS-83-12229)
(AD-A149748; BN-1033) Avail: NTIS HC A03/MF A01 CSCL 20/11

This work continues a series of papers on the bending of thin symmetric plates with rapidly varying thickness. The authors compare the relative strengths for the three different choices of scalings. In the case of an isotropic material and one family of stiffeners, our results are complete. For other geometries and/or anisotropic materials, more work (including computations) is still needed. GRA

N85-21705# Naval Postgraduate School, Monterey, Calif.
SCATTERED DATA INTERPOLATION USING THIN PLATE SPLINES WITH TENSION Interim Report, Jun. - Dec. 1984
R. Franke Dec. 1984 60 p
(AD-A149803; NPS53-85-0005) Avail: NTIS HC A04/MF A01 CSCL 20/11

The equation of an infinite thin plate under the influence of point loads and mid-plane forces is developed. The properties of the function as the tension goes to zero or becomes large is investigated. This function is then used to interpolate scattered data, giving the user the parameter of tension to give some control over overshoot when the surface has large gradients. Examples illustrating the behavior of the interpolation function are given. GRA

N85-21706# State Univ. of New York, Stony Brook. Dept. of Applied Mathematics and Statistics.
AXIOMATIC CHARACTERIZATIONS OF CONTINUUM STRUCTURE FUNCTIONS
C. Kim and L. A. Baxter Nov. 1984 13 p
(Grants NSF ECS-83-06871; AF-AFOSR-0243-84)
(AD-A149817; AFOSR-84-1202TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

A continuum structure function is a nondecreasing mapping from the unit hypercube to the unit interval. Axiomatic characterizations of the continuum structure functions based on the Barlow-Wu and Natvig multistate structure functions are derived. Author (GRA)

N85-21707# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
A SOLUTION METHOD FOR LARGE DEFORMATION CONTACT PROBLEMS Contract Report, Aug. 1982 - Aug. 1983
K. J. Bathe Aberdeen Proving Ground, Md. Ballistic Research Labs. Oct. 1984 70 p
(Contract DAAK11-82-K-0015; DA Proj. 1L1-61102-AH-43)
(AD-A149842; AD-F300551; BRL-CR-534) Avail: NTIS HC A04/MF A01 CSCL 20/11

A solution procedure for the analysis of planar and axisymmetric contact problems involving sticking, frictional sliding and separation under large deformations is presented. The contact conditions are imposed using the total potential of the contact forces with the geometric compatibility conditions, which leads to contact system matrices and force vectors. Some key aspects of the procedure are the gradient matrix corresponding to sliding, the use of distributed tractions on the contact segments for deciding whether a node is sticking, sliding, or releasing and the evaluation of the nodal point contact forces. The solutions to various sample problems are presented to demonstrate the applicability of the algorithm. GRA

N85-21708# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
A SOLUTION METHOD FOR NONLINEAR DYNAMIC ANALYSIS OF SHELL STRUCTURES Contract Report, May 1982 - Jun. 1983
K. J. Bathe Aberdeen Proving Ground, Md. Ballistic Research Labs. Oct. 1984 57 p
(Contract DAAK11-82-K-0005; DA Proj. 1L1-61102-AH-43)
(AD-A149846; AD-F300554; BRL-CR-535) Avail: NTIS HC A04/MF A01 CSCL 13/13

A new four-node (non-flat) general quadrilateral shell element for geometric and material static and dynamic nonlinear analysis is presented. The element is formulated using three-dimensional continuum mechanics theory and it is applicable to the analysis of thin and thick shells. The formulation of the element and the solutions to various test and demonstrative example problems are presented and discussed. GRA

N85-21709# Princeton Univ., N. J. Dept. of Civil Engineering.
MOVING NONLOCAL CRACK: ANTI-PLANE SHEAR CASE Final Technical Report
N. Ari and A. C. Eringen Dec. 1984 26 p
(Contract N00014-83-K-0126)
(AD-A149996; Rept-84-SM-13; TR-63) Avail: NTIS HC A03/MF A01 CSCL 20/11

The present work is concerned with the investigation of the stress distribution near the tip of a uniformly moving crack in a brittle elastic solid. To this end, we employ the recently developed

theory of nonlocal elasticity which incorporates important features of atomic lattice dynamics relevant to the study of microscopic defects, as well as macroscopic phenomena that fall within the domain of classical elasticity in the long wave-length limit. GRA

N85-21710# Army Materials and Mechanics Research Center, Watertown, Mass.
PROCEEDINGS OF THE 9TH BIENNIAL ARMY SYMPOSIUM ON SOLID MECHANICS. ADVANCES IN SOLID MECHANICS FOR DESIGN AND ANALYSIS Final Report
Oct. 1984 429 p Proc. held at Newport, R.I., 1-3 Oct. 1984
(AD-A150042) Avail: NTIS HC A19/MF A01 CSCL 20/11

The Army Symposium, 1984, was the ninth in a series of biennial meetings sponsored by the Army Materials and Mechanics Research Center (AMMRC), Watertown, Massachusetts. The symposium consisted of various types of presentations; namely, Keynote Themes; Overviews of related federally sponsored research; full technical papers and a series of brief presentations and discussions of current, but not necessarily complete, research. This document contains the technical manuscripts and the abstracts for the various presentations. Some of the sessions pertained to: New Computing Systems and Their Impact on Structural Calculation; Current and Future Developments of Experimental Mechanics; Overviews of Sponsored Research; Experimental Methods; Modeling Special Effects; Analysis, Design and Reliability; Composite Applications Design Analysis Test and Evaluation; Special Sessions on Composites; Design & Analysis of Projectiles & Munitions; and Solid Mechanics in Penetration Phenomena. GRA

N85-21711# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
FRACTURE ANALYSIS OF CRACKS IN COMPLETE CYLINDRICAL SHELLS Final Technical Report
J. Lyell Sanders, Jr. 3 Dec. 1984 3 p
(Contract N00014-81-K-0668)
(AD-A150091) Avail: NTIS HC A02/MF A01 CSCL 20/11

This final tech report discusses fracture analysis contributions in the context of other activity on the problem of circumferential cracks in pipes or cylindrical shells. The circumferential through-crack problem in shallow cylindrical shells was investigated by a succession of authors (Folias, Erdogan and Delale, Duncan and Sanders, and Simmonds). The solution, i.e., the determination of the stress intensity factors and/or the energy release rate had been established for the complete range of the parameters involved according to linear elastic fracture mechanics. However, it was not known how long the crack might be in relation to the circumference for the results to be valid, since the analyses were all based on shallow shell theory. In 1979 Barsoum et al. obtained results for long circumferential cracks in the complete cylinder by finite element methods. The calculations were necessarily for pipes of finite length and some unknown end effects were present. The present investigator published results (1982) obtained by a new analytical method for long circumferential through cracks in a pipe under axial tension. These results were in closed form and applied to pipes of infinite length. Research under the present contract began with similar calculations made for the pipe under combined bending and tension. Results obtained by this means agree quite well (in an overlap range) with previous results from shallow shell theory, and since the results were in closed form no parameter studies were necessary. GRA

N85-21712# Pacific Northwest Lab., Richland, Wash.
STEAM GENERATOR TUBE VIBRATION TESTS
W. I. Enderlin Oct. 1984 11 p refs Presented at the 12th Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 25 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE85-003599; PNL-SA-12667; CONF-8410142-64) Avail: NTIS HC A02/MF A01

The effects of increased tube/tube-support clearances on rate of tube wear caused by flow-induced vibration in PWR steam generators are discussed. Licensee's criteria to evaluate specific proposals for chemical cleaning of steam generators are addressed. DOE

N85-21713# Rochester Univ., N. Y. Dept. of Mechanical Engineering.
FRACTURE TOUGHNESS OF MATERIALS Progress Report, Feb. - Oct. 1984
S. J. Burns 1984 14 p refs
(Grant DE-FG02-84ER-45051)
(DE85-004306; DOE/ER-45051/01) Avail: NTIS HC A02/MF A01

Crack tip deformation in single crystals was quantatively measured by observing screw and edge character dislocations at mode 1 and 2 crack tips. Each dislocation shields the true crack tip from the applied stress intensity factor. The thermal expansion of materials in a pressure-volume-temperature system was proved to never change sign. The proof is based on the second law of thermodynamics. DOE

N85-21714# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
COMPUTER ANALYSIS OF WIND TURBINE BLADE DYNAMIC LOADS
Robert Thresher, Edward L. Hershberg (Techtronics, Inc., Beaverton, Ore.), and Alan D. Wright Nov. 1984 12 p refs Presented at the 4th ASME Wind Energy Symp., Dallas, 18-20 Feb. 1985
(Contract DE-AC02-83CH-10093)
(DE85-000530; SERI/TP-214-2563; CONF-850218-3) Avail: NTIS HC A02/MF A01

The flapping motion of a single wind turbine rotor blade was analyzed and equations describing the flapping motion were developed. The analysis was constrained to allow only flapping motions for a cantilevered blade, and the equations of motion are linearized. A computer code, called FLAP (Force and Loads Analysis Program), to solve the equations of motion and compute the blade loads was completed and compared to measured loads for a j bladed downwind turbine with stiff blades. The results of the program are presented in tabulated form for equidistant points along the blade and equal azimuth angles around the rotor disk. The blade deflection, slope and velocity, flapwise shear and moment, edgewise shear and moment, blade tension, and blade torsion are given. The deterministic excitations considered in the analysis include wind shear, tower shadow, gravity, and a prescribed yaw motion. DOE

N85-21715# California Univ., Davis. Dept. of Applied Science.
NUMERICAL SIMULATION OF STATIC AND DYNAMIC SHADOW PATTERNS USING AN ATOMISTIC DESCRIPTION OF CRACK INITIATION AND PROPAGATION
B. Moran, W. G. Hoover, and D. M. Norris (Electric Power Research Inst., Palo Alto, Calif.) Oct. 1984 7 p refs Presented at the 6th Intern. Conf. on Fracture, New Delhi, 4-10 Dec. 1984
(Contract W-7405-eng-48)
(DE85-003226; UCRL-91763; CONF-841203-3) Avail: NTIS HC A02/MF A01

Crack propagation is modeled from an atomistic point of view. An understanding of the phenomenology of crack propagation in a decreasing stress field is sought. The objective is to better understand the interpretations and implications of optical measurements (Kalthoff, Beinert, and Winkler, 1977a) of stress intensities. The computational method is to use the simplest interatomic potential which captures the important features of real interactions and structure of cracks from a discrete point of view. In the atomistic approach, the fracture criterion is not independently specified but rather follows, along with all other macroscopic constitutive quantities, from the interparticle forces. A model was developed to estimate the average strength of the stress singularity from a direct simulation of the shadow pattern using the strain distribution around the crack tip. This model was applied to the steady state propagation of a crack in a finite strip and obtained good agreement with Nilsson's (1972, 1973) corresponding continuum solution. DOE

N85-21716# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
YIELD JOINT CONDITION FOR THREE-DIMENSIONAL I-BEAMS [FLIESSGELENKBEDINGUNG BEI RAEUMLICHEN BALKENT-RAGWERKEN AUS I-PROFILEN]
Heribert Wessels 1984 87 p refs In GERMAN
(ILR-Mitt-137) Avail: NTIS HC A05/MF A01

A yield joint condition for thin-walled I-beams made of ideally elastic-ideally plastic materials was developed. The reference stress obtained with the Huber-Mises-Hencky hypothesis is assumed to be maximum equal to the yield stress. The equations consider the contribution of the shear stress cross section quantities to the cutting force interaction during the formation of a yield joint. Other equations take into account the bending moment around the weak and strong axes, the buckling moment, and the normal force. An algorithm is developed which, together with a three-dimensional beam element, is embedded in the nonlinear finite element program NILIFEM, to calculate general three-dimensional I-beams under static loading following the yield joint theory of second order. Author (ESA)

N85-21717# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
RING-ON-RING TESTS AND LOAD CAPACITY OF CLADDING GLASS Final Report
E. Simiu, D. A. Reed, C. W. C. Yancey, J. W. Martin, and E. M. Hendrickson Aug. 1984 64 p refs
(Grant NSF CEE-83-08329)
(PB85-106391; NBS/BSS-162; LC-84-601098) Avail: NTIS HC A04/MF A01; SOD HC as SN0003-003-02605-1 CSCL 13C

Although ring on ring test results were used in the past to obtain information on the strength of glass, no methodology was developed in the literature explicitly relating such results to the load capacity of cladding glass. The main purpose is to propose such a methodology. The proposed methodology makes use of recent advances in the modeling of the fracture mechanics behavior of glass and the calculation of stresses in plates exhibiting geometric nonlinearity. Evidence is presented which strongly suggests that the probability distribution of the load capacity of cladding glass panels whose failure is due to surface flaws can be estimated reliably on the basis of results of ring on ring tests used in conjunction with: (1) numerical methods for the analysis of stresses in plates, and (2) information on the elastic and fracture mechanics behavior of glass currently available or that can be obtained routinely. Author (GRA)

N85-21718# Sydney Univ. (Australia). School of Civil and Mining Engineering.
BEHAVIOR OF BURIED FLEXIBLE CYLINDERS UNDER THE INFLUENCE OF NONUNIFORM HOOP COMPRESSION
Ian D. Moore and John R. Booker Dec. 1983 34 p refs
(PB85-116523; R-464) Avail: NTIS HC A03/MF A01 CSCL 13L

General linearized differential equations of equilibrium are derived for a thin circular cylinder under the influence of nonuniform initial stress. The problem of a long flexible tube buried in an elastic continuum prestressed by nonhydrostatic biaxial field stress is studied. The classical eigenvalue problem is formulated to determine the distributions of nonuniform stress resultants which destabilize the tube in its initial circular configuration. The simplest ring theory where only bending deformations are considered is found to provide a simple and accurate solution to the problem, and a parametric study is carried out to facilitate the use of the solution. GRA

N85-21719# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR ANALYSIS OF LAYERED COMPOSITE PLATES AND SHELLS Final Report
J. N. Reddy Jan. 1984 64 p refs
(Grant AF-AFOSR-81-0142)
(PB85-127181; VPI-E-84-5) Avail: NTIS HC A04/MF A01 CSCL 20K

The finite element programs developed for plates and shells are discussed. The theoretical basis of the finite element is the following: A shear deformation version of the Sanders theory for doubly curved shells used while accounting for the large rotations of the von Karman theory and arbitrary lamination of orthotropic layers. As a special case, when the principal curvatures are set to zero, one can obtain the Mindlin shear deformation theory of laminated plates. Exact solutions of the linear theory, for certain lamination schemes and boundary conditions, were also obtained to validate the finite element solutions. The finite element program is used to analyze both static and transient behavior of plates and shells. GRA

N85-21720*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
GEOMETRICALLY NONLINEAR ANALYSIS OF LAMINATED ELASTIC STRUCTURES Final Report
J. N. Reddy Nov. 1984 107 p refs
(Grant NAG3-208)
(NASA-CR-175609; NAS 1.26:175609; PB85-127173; VPI-E-84-36) Avail: NTIS HC A06/MF A01 CSCL 20K

Laminated composite plates and shells that can be used to model automobile bodies, aircraft wings and fuselages, and pressure vessels among many other were analyzed. The finite element method, a numerical technique for engineering analysis of structures, is used to model the geometry and approximate the solution. Various alternative formulations for analyzing laminated plates and shells are developed and their finite element models are tested for accuracy and economy in computation. These include the shear deformation laminate theory and degenerated 3-D elasticity theory for laminates. GRA

N85-21721# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
CHARACTERISATION OF FATIGUE CRACK EXTENSION BY QUANTITATIVE ACOUSTIC EMISSION
C. B. Scruby, G. R. Baldwin, and K. A. Stacey Oct. 1984 43 p refs
(AERE-R-11289) Avail: Issuing Activity

A calibrated four channel elastic wave recording system was used to detect and characterize acoustic emission events associated with the growth of a fatigue crack in a compact tension specimen of 7010 aluminum alloy. The transducers sampled the elastic wave field in four independent directions in a plane perpendicular to the crack. The 2-D force dipole representation of each event, assumed to be a point source, was deduced by inversion of the Green's tensor. Each emission event was then characterized in terms of source type (e.g., microfracture, slip), orientation relative to fatigue crack and size (e.g., crack volume). All of the events (other than clearly distinguishable signals due to fretting at the loading pins) were located within 0.5mm of the crack tip. 80% of the recorded events had the character of fracture, and were mostly oriented approximately parallel to the fatigue crack. The typical event size was approximately 2,000 cubic microns. It is believed that the principal source of emission was brittle inclusion fracture at, or close to the crack tip. R.J.F.

N85-21722# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
THE MEASUREMENT OF RESIDUAL STRESSES USING ULTRASONICS
D. R. Allen Oct. 1984 30 p refs
(AERE-R-11415) Avail: Issuing Activity

The work carried out at the measurement of residual stresses using ultrasonics is summarized. The unit problems encountered are discussed, namely those of measurement accuracy and the effects of preferred crystallite oriontation (texture), and the steps taken to overcome recently by using EMATs and signal processing. It is shown that two techniques now exist which can be used to eliminate the effects of texture. Author

N85-22222*# Mississippi State Univ., State College. Dept. of Chemical Engineering.
RELIABILITY OF STRUCTURAL BRITTLE MATERIALS

William B. Hall *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 18p refs (For primary document see N85-22210 12-80) Avail: NTIS HC A99/MF E03 CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-21723* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD OF MEASURING SEA SURFACE WATER TEMPERATURE WITH A SATELLITE INCLUDING WIDEBAND PASSIVE SYNTHETIC-APERTURE MULTICHANNEL RECEIVER Patent

Joseph M. Stacey, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 12 Feb. 1985 11 p Filed 6 May 1982 Supersedes N82-26523 (20 - 17, p 2390) Sponsored by NASA (NASA-Case-NPO-15651-1; NAS 1.71:NPO-15651-1; US-Patent-4,499,470; US-Patent-Appl-SN-375620; US-Patent-Class-343-352; US-Patent-Class-374-122) Avail: US Patent and Trademark Office CSCL 14B

A wideband passive synthetic-aperture multichannel receiver with an antenna is mounted on a satellite which travels in an orbit above the Earth passing over large bodies of water, e.g., the Atlantic Ocean. The antenna is scanned to receive signals over a wide frequency band from each incremental surface area (pixel) of the water which are related to the pixel's sea temperature. The received signals are fed to several channels which are tuned to separate selected frequencies. Their outputs are fed to a processor with a memory for storage. As the antenna points to pixels within a calibration area around a buoy of known coordinates, signals are likewise received and stored. Exactly measured sea temperature is received from the buoy. After passing over several calibration areas, a forward stepwise regression analysis is performed to produce an expression which selects the significant from the insignificant channels and assigns weights (coefficients) to them. The expression is used to determine the sea temperature at each pixel based on the signals received therefrom. Wind temperature, pressure, and wind speed at each pixel can also be calculated.

Official Gazette of the U.S. Patent and Trademark Office

N85-21724*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LANDSAT-4 SCIENCE CHARACTERIZATION EARLY RESULTS. VOLUME 3, PART 2: THEMATIC MAPPER (TM)

John L. Barker, ed. Washington Jan. 1985 591 p refs Symp. held in Greenbelt, Md., 22-24 Feb. 1983 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS 4 Vol. (E85-10069; NASA-CP-2355-Vol-3-Pt-2; Rept-85B0115-Vol-3-Pt-2; NAS 1.55:2355-Vol-3-Pt-2) Avail: NTIS HC A25/MF A01 CSCL 08B

The calibration of the LANDSAT 4 thematic mapper is discussed as well as the atmospheric, radiometric, and geometric accuracy and correction of data obtained with this sensor. Methods are given for assessing TM band to band registration. For individual titles, see N85-21725 through N85-21746.

N85-21725*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RELATIVE RADIOMETRIC CALIBRATION OF LANDSAT TM REFLECTIVE BANDS

John L. Barker *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 1-219 refs Revised Previously announced as N84-31757 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 14B

Results and recommendations pertaining to the characterization of the relative radiometric calibration of the protoflight thematic mapper (TM/PF) on the LANDSAT-4 satellite are presented. Some preliminary pre-launch and in-orbit results are also included from the flight model (TM/F) on LANDSAT-5. A common scientific methodology and terminology is outlined for characterizing the radiometry of both TM sensors. The magnitude of the most significant sources of radiometric variability are discussed and methods are recommended for achieving the exceptional potential inherent in the radiometric precision and accuracy of the sensors. A.R.H.

N85-21726*# Rochester Inst. of Tech., N. Y. School of Photographic Arts and Sciences.

EVALUATION OF THE RADIOMETRIC INTEGRITY OF LANDSAT 4 THEMATIC MAPPER BAND 6 DATA

John R. Schott *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 221-231 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 14B

Probably the most generally accepted method for processing radiometric data from space is to correct the observed radiance or apparent temperature to a surface radiance or temperature value using atmospheric propagation models. As part of NASA's Heat Capacity Mapping Mission (HCMM) experiment the atmospheric propagation models were used in reverse in an attempt to evaluate the post launch radiometric response of the radiometer. Techniques successfully used to radiometrically calibrate the HCMM sensor were extended. The HCMM experiment is described and used as a base for the evaluation of the TM band 6 (infrared) sensor. A.R.H.

N85-21727*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THERMAL BAND CHARACTERIZATION OF THE LANDSAT-4 THEMATIC MAPPER

Jack C. Lansing (Santa Barbara Research Center, Calif.) and John L. Barker *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 233-256 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 14B

The initial characterization of the Thematic Mapper (TM) thermal band is reported including gain stability, gain relation to internal calibration, corrections for channel-to-channel and scan direction differences, an approximate comparison to ground truth, and a calculation of noise equivalent temperature difference. Updated calibration information is also presented. A.R.H.

N85-21728*# Department of Energy, Mines, and Resources, Ottawa (Ontario).

A PRELIMINARY ASSESSMENT OF LANDSAT-4 THEMATIC MAPPER DATA

D. G. Goodenough, E. A. Fleming, and K. Dickinson *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 257-273 refs ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 08B

The geometric errors for image to map rectification of one Thematic Mapper (TM) scene of an area near Windsor, Ontario were studied. The scene had been produced on computer

compatible tape by NASA and contained radiometric and system corrections for geometric distortions. The geometric properties of TM photographic imagery permitted very good fitting to map detail using simple scaling techniques to localized areas and, using simple scaling, the overall geometry remained with 500 meters or 0.4 mm at the image scale of 1:1,141,600. An affine transformation, permitting differential scaling, slightly improves the fit to about 400 meters or 0.35 mm at image scale. The imagery shows promise of having the needed additional resolution and spectral discrimination to provide map revision information in urban-rural areas where the MSS sensor is considered inadequate. The late-season prairie image, however, did not hold such promise, and judgement must be reserved until images are acquired at other seasons in this particular geographic area. A.R.H.

N85-21729*# Canada Centre for Remote Sensing, Ottawa (Ontario).
PRELIMINARY EVALUATION OF THE RADIOMETRIC CALIBRATION OF LANDSAT-4 THEMATIC MAPPER DATA BY THE CANADA CENTRE FOR REMOTE SENSING
J. Murphy, W. Park, and A. Fitzgerald *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 275-307 refs ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 14B

The radiometric characteristics of the LANDSAT-4 TM sensor are being studied with a view to developing absolute and relative radiometric calibration procedures. Preliminary results from several different approaches to the relative correction of all detectors within each band are reported. Topics covered include: the radiometric correction method; absolute calibration; the relative radiometric calibration algorithm; relative gain and offset calibration; relative gain and offset observations; and residual radiometric stripping. A.R.H.

N85-21730*# European Space Agency. ESRIN, Frascati (Italy).
A PRELIMINARY ANALYSIS OF LANDSAT-4 THEMATIC MAPPER RADIOMETRIC PERFORMANCE
C. Justice, L. Fusco, and W. Mehl (Joint Research Centre of the European Communities) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 309-320 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 14B

The NASA raw (BT) product, the radiometrically corrected (AT) product, and the radiometrically and geometrically corrected (PT) product of a TM scene were analyzed examine the frequency distribution of the digital data; the statistical correlation between the bands; and the variability between the detectors within a band. The analyses were performed on a series of image subsets from the full scence. Results are presented from one 1024 c 1024 pixel subset of Realfoot Lake, Tennessee which displayed a representative range of ground conditions and cover types occurring within the full frame image. From this cursory examination of one of the first seven channel TM data sets, it would appear that the radiometric performance of the system is most satisfactory and largely meets pre-launch specifications. Problems were noted with Band 5 Detector 3 and Band 2 Detector 4. Differences were observed between forward and reverse scan detector responses both for the BT and AT products. No systematic variations were observed between odd and even detectors. A.R.H.

N85-21731*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EVALUATION OF THE RADIOMETRIC QUALITY OF THE TM DATA USING CLUSTERING, LINEAR TRANSFORMATIONS AND MULTISPECTRAL DISTANCE MEASURES
L. A. Bartolucci, M. E. Dean, and P. E. Anuta *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 321-358 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

The radiometric quality of LANDSAT 4 TM data for the classification and identification of Earth surface features was evaluated. Techniques employed in the evaluation included clustering, data compression (linear transformations), multispectral distance measures, and hierarchical classification methods. TM and MSS data for the Chicago, Illinois test site were studied. In order to determine the radiometric quality of the TM thermal data for temperature mapping of surface water, a test site was selected within the area covered by the TM scene (Scene ID: 40101-16025) gathered over Illinois. This site was chosen because it includes a surface water body with a large range of temperatures, i.e., a cooling pond for the Dresden nuclear power plant and the junction of two rivers. R.S.F.

N85-21732*# European Space Agency. ESRIN, Frascati (Italy).
TM GEOMETRIC PERFORMANCE: LINE TO LINE DISPLACEMENT ANALYSIS (LLDA)
L. Fusco and W. Mehl *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 359-388 refs Previously announced as N84-19983 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

An early acquired TM data frame (track 23, frame 35 of 22 August 1982) was used to assess the geometric performance of the LANDSAT-4 thematic mapper instrument. The developed method consists in determining the displacements of adjacent lines by locating the maximum of the correlation profile between the two lines. Then the line to line displacement is used to charactertze the TM instrument in respect to: scan to scan jitter and image skew, scan profile non-linearity, along scan jitter, detector to detector displacement, and band to band displacement. To verify the quality of the reported performance parameters, some extracted geometric parameters were used to correct the original raw data. Comparison between P-tape data and results of reprocessed data shows no significant differences in an area of 1024 x 1024 pixels. A.R.H.

N85-21733*# Arizona Univ., Tucson. Optical Sciences Center.
IN-PROGRESS ABSOLUTE RADIOMETRIC INFLIGHT CALIBRATION OF THE LANDSAT-4 SENSORS
K. R. Castle, M. Dinguirard (Centre d'Etudes et de Recherces de Toulouse), C. E. Ezra (Agricultural Research Service, Phoenix, Ariz.), R. G. Holm, R. D. Jackson (Agricultural Research Service, Phoenix, Ariz.), C. J. Kastner, J. M. Palmer, R. Savage (Atmospheric Sciences Lab.), and P. N. Slater *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 389-410 refs ERTS (For primary document see N85-21724 12-43)
(Contract NAS5-27382)
Avail: NTIS HC A25/MF A01 CSCL 14B

Using selected instrumented areas at White Sands Missile Range, New Mexico as reference, radiometric calibration is to be effected on the sensors of LANDSAT 4, particularly the thematic mapper. Optical measurements made during a TM overpass are discussed. The radiances of selected large ground areas are measured in the spectral bandpasses of the TM; the total optical thickness of the atmosphere is measured in nine narrow spectral intervals. Ground truth in the form of reflectances collected for the alkalai flat region of gypsum and for the snow at White Sands is described. R.S.F.

N85-21734*# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Service.
LANDSAT-4 THEMATIC MAPPER CALIBRATION AND ATMOSPHERIC CORRECTION
Warren A. Hovis *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 411-420 ref ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 14B

The LANDSAT-4 thematic mapper, with its wide spectral coverage and digitization to 8 bits per word, is a large step forward

in the direction of quantitative radiometry from the multispectral scanner (MSS). In order to utilize the quantitative accuracy built into the thematic mapper effectively, more attention must be paid to calibration before launch, changes of calibration with time in orbit, and atmospheric interference with the measurements, especially in the 450 to 520 nanometer band. Experience with the coastal zone color scanner (CZCS) program led to procedures wherein Rayleigh correction factors can be generated utilizing simultaneous surface truth data that empirically give correct upwelled surface radiances, despite errors in sensor calibration, solar spectral irradiance measurements, and reported values of Rayleigh optical depth. These techniques offer sensitive tests for change in calibration, especially at shorter wavelengths. Instruments, such as the CZCS, have shown that calibration changes first, and to the largest degree, at the shorter wavelengths, with lesser changes as wavelength increases. These techniques are utilized to calculate a Rayleigh correction factor that, together with geometric terms, should give an accurate correction for this portion of the atmospheric contribution to the signal. R.S.F.

N85-21735*# Environmental Research Inst. of Michigan, Ann Arbor.

SCAN ANGLE AND DETECTOR EFFECTS IN THEMATIC MAPPER RADIOMETRY

Michael D. Metzler and William A. Malila *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 421-442 refs ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 20F

The effects of scan angle and interdetector differences on thematic mapper radiometry were analyzed. The data set used for this study consisted of computer compatible tapes (CCT's) of raw data (CCT-BT), radiometrically corrected data (CCT-AT), and geometrically corrected data (CCT-PT) for two scenes, 40049-16262 (north central Iowa) and 40037-16031 (Arkansas). Radiometric corrections currently performed were found to improve overall consistency of data, but some residual stripping remains in the corrected data due to the quantization of signal values and other effects. A new type of banding was discovered which is related to the bi-directional scanning of TM. An initial empirical model was developed for correcting this effect in band 1, but should receive additional development. The scan angle effects observed corresponded to those expected based on atmospheric considerations and scene characteristics. Low frequency scan-to-scan noise was detected in band 1, band 7, and to a lesser extent in bands 2 and 3. The band 1 detectors which exhibited this noise showed strong correlation in their variation. R.S.F.

N85-21736*# Environmental Research Inst. of Michigan, Ann Arbor.

THEMATIC MAPPER SPECTRAL DIMENSIONALITY AND DATA STRUCTURE

E. P. Crist and R. C. Cicone *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 443-466 refs ERTS (For primary document see N85-21724 12-43)

(Contract NAS5-16538)

Avail: NTIS HC A25/MF A01 CSCL 05B

A simulated LANDSAT 4 TM and MSS data set, representing three crops over three growing seasons and a wide variety of soil types, was used to evaluate the structure of TM data and to compare its characteristics to those of MSS data. TM bands 2, 3, and 4, transformed to tasseled cap-like coordinates, provide an equivalent data space to MSS tasseled cap data, with greater dynamic range and no apparent loss of information resulting from the exclusion of the 0.9 to 1.1 micron region. Data from the six reflective TM bands (excluding the thermal band) primarily occupy two planes and a transition zone between them. The plane of vegetation is comparable to the MSS tasseled cap plane, while the plane of soils and transition zone provide a new dimension of information unavailable from the MSS. This added dimension offers promise of improved ability to determine the relative mix of vegetation and soil in the sensor field of view and to estimate soil moisture status. The improvement in spectral characteristics of the TM over the MSS, not to mention the greater spatial resolution, have resulted in a significant increase in the information content of the data. R.S.F.

N85-21737*# Arizona Univ., Tucson. Remote Sensing Center.

MTF ANALYSIS OF LANDSAT-4 THEMATIC MAPPER

Robert Schowengerdt *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 467-470 refs Previously announced as N83-33285 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 14D

The spatial radiance distribution of a ground target must be known to a resolution at least four to five times greater than that of the system under test when measuring a satellite sensor's modulation transfer function. Calibration of the target requires either the use of man-made special purpose targets with known properties, e.g., a small reflective mirror or a dark-light linear pattern such as line or edge, or use of relatively high resolution underflight imagery to calibrate an arbitrary ground scene. Both approaches are to be used, in addition a technique that utilizes an analytical model of the scene spatial frequency power spectrum is being investigated as an alternative to calibration of the scene. A.R.H.

N85-21738*# Geological Survey, Flagstaff, Ariz.

INTRABAND RADIOMETRIC PERFORMANCE OF THE LANDSAT 4 THEMATIC MAPPER

Hugh H. Kieffer, Eric M. Eliason, and Pat S. Chavez, Jr. *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 471-496 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 14B

Those radiometric characteristics of the LANDSAT 4 thematic mapper (TM) that could be established without absolute calibration of spectral data were examined. Radiometrically raw (B type) data of three daytime and two nighttime scenes were used, including TM scenes from Washington, DC; northeast Arkansas; Cape Cod, MA; Roanoke, VA; Richmond, VA; and Silver Bell, AZ. The effective resolution in radiance is degraded by a factor of about 2 by the irregular width of the digital levels. Underpopulated levels are consistent over all bands and detectors, and are spaced an average of 4 digital numbers (DN) apart. In band 6, level 127 is avoided by a factor 30. Several detectors exhibit a change of gain with a period of several scans; the largest effect is about 4%. At high contrast boundaries, some of the detectors in band 5 commonly overshoot by several DN and require about 30 samples to recover. The high frequency noise level of each detector was characterized by the standard deviation of the first derivative in the sample direction across a flat field. A coherent-sinusoidal-noise pattern is evident in detector 1 of band 3. The correlation between the six reflective bands was determined and used to select three groups of bands whose aggregate first principal components contain the greatest total information. A composite of the first components of bands 1, 2, 3, bands 5 and 7, and band 4, together containing 89% of the information in the reflectance bands, has reduced the effect of noise. R.S.F.

N85-21739*# Geological Survey, Reston, Va.

A PRELIMINARY EVALUATION OF LANDSAT-4 THEMATIC MAPPER DATA FOR THEIR GEOMETRIC AND RADIOMETRIC ACCURACIES

M. H. Podwysocki, N. Falcone, L. U. Bender, and O. D. Jones *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 492-512 refs Previously announced as N83-32136 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)

Avail: NTIS HC A25/MF A01 CSCL 05B

Some LANDSAT thematic mapper data collected over the eastern United States were analyzed for their whole scene geometric accuracy, band to band registration and radiometric accuracy. Band ratio images were created for a part of one scene

in order to assess the capability of mapping geologic units with contrasting spectral properties. Systematic errors were found in the geometric accuracy of whole scenes, part of which were attributable to the film writing device used to record the images of film. Band to band registration showed that bands 1 through 4 were registered to within one pixel. Likewise, bands 5 and 7 also were registered to within one pixel. However, bands 5 and 7 were misregistered with bands 1 through 4 by 1 to 2 pixels. Band 6 was misregistered by 4 pixels to bands 1 through 4. Radiometric analysis indicated two kinds of banding, a modulo-16 stripping and an alternate light dark group of 16 scanlines. A color ratio composite image consisting of TM band ratios 3/4, 5/2, and 5/7 showed limonitic clay rich soils, limonitic clay poor soils, and nonlimonitic materials as distinctly different colors on the image.
Author

N85-21740*# Systems and Applied Sciences Corp., Hyattsville, Md.
THE USE OF LINEAR FEATURE DETECTION TO INVESTIGATE THEMATIC MAPPER DATA PERFORMANCE AND PROCESSING
Charlotte M. Gurney *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 513-526 refs Previously announced as N84-13680 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

The geometric and radiometric characteristics of thematic mapper data through analysis of linear features in the data are investigated. The particular aspects considered are: (1) thematic mapper ground IFUV; (2) radiometric contrast between linear features and background; (3) precision of system geometric correction; (4) band-to-band registration; and (5) potential utility of TM data for linear feature detection especially as compared to MSS data. It is shown that TM data may be used to estimate TM pixel size illustrate band: band mis-registration. M.G.

N85-21741*# Purdue Univ., Lafayette, Ind.
SPATIAL RESOLUTION ESTIMATION OF LANDSAT-4 THEMATIC MAPPER DATA
Clare D. McGillem, Paul E. Anuta, and Erick Malaret *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 527-536 refs ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 14B

The problem of estimating the overall point-spread function (PSF) of multispectral scanner systems was studied using real scene data and known geometric structures in the scene. A direct solution to an approximate form of the PSF was made along with a method using the derivative of an estimated edge response. Both results agreed closely. The TM scanner system specifications are given in line-spread function width and these values are listed with the experimental results in terms of meters. The estimated values are very reasonable, considering the number of factors which could be influencing the result. The atmosphere will have a blurring effect on the overall PSF as well as on cubic convolution resampling effects and possible electronic effects not accounted for in the specification. Also, the specific definition of the LSF specification is not known nor is the actual altitude at the instant the data were acquired. Thus the nominal overall PSF half-amplitude width of 39 m is reasonable; however, a greater sample of scene objects should be evaluated to furthur verify this result.
Author

N85-21742*# Research and Data Systems, Inc., Lanham, Md.
AN ANALYSIS OF THE HIGH FREQUENCY VIBRATIONS IN EARLY THEMATIC MAPPER SCENES
John Kogut and Eliane Larduinat *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 537-552 refs ERTS (For primary document see N85-21724 12-43)
(Contract NAS5-27371)
Avail: NTIS HC A25/MF A01 CSCL 20K

The motion of the mirrors in the thematic mapper (TM) and multispectral scanner (MSS) instruments, and the motion of other devices, such as the TDRSS antenna drive, and solar array drives onboard LANDSAT-4 cause vibrations to propagate through the spacecraft. These vibrations as well as nonlinearities in the scanning motion of the TM mirror can cause the TM detectors to point away from their nominal positions. Two computer programs, JITTER and SCDFT, were developed as part of the LANDSAT-D Assessment System (LAS), Products and Procedures Analysis (PAPA) program to evaluate the potential effect of high frequency vibrations on the final TM image. The maximum overlap and underlap which were observed for early TM scenes are well within specifications for the ground processing system. The cross scan and scan high frequency vibrations are also within the specifications cited for the flight system. B.G.

N85-21743*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESSMENT OF THEMATIC MAPPER BAND-TO-BAND REGISTRATION BY THE BLOCK CORRELATION METHOD
Don H. Card, Robert C. Wrigley, Frederick C. Mertz (Technicolor Government Services, Inc., Moffett Field, Calif.), and Jeff R. Hall (Technicolor Government Services, Inc., Moffett Field, Calif.) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 553-564 refs Previously announced as N83-33286 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

Rectangular blocks of pixels from one band image were statistically correlated against blocks centered on identical pixels from a second band image. The block pairs were shifted in pixel increments both vertically and horizontally with respect to each other and the correlation coefficient to the maximum correlation was taken as the best estimate of registration error for each block pair. For the band combinations of the Arkansas scene studied, the misregistration of TM spectral bands within the noncooled focal plane lie well within the 0.2 pixel target specification. Misregistration between the middle IR bands is well within this specification also. The thermal IR band has an apparent misregistration with TM band 7 of approximately 3 pixels in each direction. The TM band 3 has a misregistration of approximately 0.2 pixel in the across-scan direction and 0.5 pixel in the along-scan direction, with both TM bands 5 and 7. A.R.H.

N85-21744*# Geological Survey, Flagstaff, Ariz.
TESTS OF LOW-FREQUENCY GEOMETRIC DISTORTIONS IN LANDSAT 4 IMAGES
R. M. Batson and W. T. Borgeson *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 565-570 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

The geometric characteristics of LANDSAT 4 images were studied. The extent of image distortion caused by the physical process of writing the LANDSAT 4 images on film was determined. The geometric accuracies inherent in the digital images themselves were characterized. Test materials consisted of film images of test targets generated by the laser beam recorders (LBR), the Optronics Photowrite film writer, and digital image films of a strip 600 lines deep across the full width of band 5 of the Washington, D.C. Thematic Mapper scene. The tests were made by least squares adjustment of an array of measured image points to a corresponding array of control points. The film test array consists of 25 test points, and the image test array consists of 60 test points, resulting in a model that can be used to characterize the low frequency, random geometric distortions of the images. The tests were not suitable for examining jitter or similar high-frequency distortions. B.G.

N85-21745*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
INVESTIGATION OF TM BAND-TO-BAND REGISTRATION USING THE JSC REGISTRATION PROCESSOR

S. S. Yao and M. L. Amis *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 571-580 refs ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

When the Thematic Mapper (TM) imagery was first received and displayed in the fall of 1982, its radiometric lucidity and geometric fidelity was judged far superior to the multispectral scanner (MSS) imagery. The MSS data from the LANDSAT series of satellites have served well as the mainstay of satellite imagery for the remote sensing community up to now. Therefore, there is great anticipation as to the utility of this new IM imagery to advance the field of remote sensing. The thematic mapper (TM) band to band registration accuracy evaluation was discussed. In particular, the band to band registration accuracies of the TM data in the subpixel region were evaluated using the Johnson Space Center (JSC) registration processor which is ideally suited for this task. The JSC registration processor was also used to register one acquisition to another acquisition of multitemporal TM data acquired over the same ground track. The approach and the rationale behind the task, the description of the data set, the evaluation results, and the preliminary conclusions are discussed. B.G.

N85-21746*# EROS Data Center, Sioux Falls, S. Dak.
GEODETIC ACCURACY OF LANDSAT 4 MULTISPECTRAL SCANNER AND THEMATIC MAPPER DATA
J. M. Thormodsgard and D. J. DeVries *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 3, Pt. 2 Jan. 1985 p 581-590 ERTS (For primary document see N85-21724 12-43)
Avail: NTIS HC A25/MF A01 CSCL 05B

Conclusive statements concerning the geodetic accuracy of LANDSAT 4 data, based on such a small sampling of scenes, is impossible. However, the results provide a few interesting observations. For example, LANDSAT 4 multispectral band scanner (MSS) system corrected errors were larger than were expected based on the knowledge of the geometric accuracy of the data from LANDSAT 2 and 3. Also, the thematic mapper (TM) system corrected scenes were more accurate than the MSS scenes by a factor of three. As the spacecraft platform for these two sensors is the same, this result cannot be explained, but a comparison of concurrently acquired MSS and TM data might clarify this situation. Finally, the single MSS ground control point (GCP) corrected product evaluated had good geodetic accuracy considering the poor distribution of the two GCP's applied in the registration.
Author

N85-21747*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATIONS OF VEGETATION AND SOILS INFORMATION CONTAINED IN LANDSAT THEMATIC MAPPER AND MULTISPECTRAL SCANNER DATA Final Report
Eric Crist, R. Laurin, J. E. Colwell, and R. J. Kauth Dec. 1984 117 p refs ERTS
(Contract NAS9-16538)
(E85-10082; NASA-CR-171857; NAS 1.26:171857; ERIM-160300-101-F) Avail: NTIS HC A06/MF A01 CSCL 05B

An extension of the TM tasseled cap transformation to reflectance factor data is presented, and the basic concepts underlying the tasseled cap transformations are described. The ratio of TM bands 5 and 7, and TM tasseled cap wetness, are both shown to offer promise of direct detection of available soil moisture. Some effects of organic matter and other soil characteristics or constituents on TM tasseled cap spectral response are also considered. A.R.H.

N85-21748*# National Oceanic and Atmospheric Administration, Columbia, Mo.
NOAA-AISC USER'S GUIDE FOR IMPLEMENTING CERES MAIZE MODEL FOR LARGE AREA YIELD ESTIMATION
Jim Larrabee and Tom Hodges Jan. 1985 21 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E85-10083; NASA-CR-175518; YM-15-00401; JSC-20237; NAS 1.26:175518) Avail: NTIS HC A02/MF A01 CSCL 02C

The subroutines used by the CERES (Crop Estimation through Resource and Environment Synthesis) to simulate the phenological development, growth, and economic yield of corn using soil and daily meteorological data are described. A.R.H.

N85-21749*# National Oceanic and Atmospheric Administration, Columbia, Mo.
USER'S GUIDE TO THE TAMW WHEAT MODEL AS IMPLEMENTED ON THE IBM 360/195 COMPUTER
Jim Larrabee and Tom Hodges Jan. 1985 11 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E85-10084; NASA-CR-175529; YM-15-00402; JSC-20238; NAS 1.26:175529) Avail: NTIS HC A02/MF A01 CSCL 02C

The implementation of the Texas A&M wheat simulation model on the IBM 360/195 computer is described. Local changes were made to the model using a wide variety of meteorological data sources. The FORTRAN code was more modularized and made easier to understand. A.R.H.

N85-21750*# National Oceanic and Atmospheric Administration, Columbia, Mo.
NOAA-AISC USER'S GUIDE FOR IMPLEMENTING CERES WHEAT MODEL FOR LARGE AREA YIELD ESTIMATION
James Larrabee and Tom Hodges Jan. 1985 27 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E85-10085; NASA-CR-175520; YM-15-00400; JSC-20236; NAS 1.26:175520) Avail: NTIS HC A03/MF A01 CSCL 02C

Subroutines used by the CERES (Crop Estimation through Resource and Environment Synthesis) to simulate crop phenological development, growth, and final yield from soil as well as daily meteorological data are described. Author

N85-21751*# National Oceanic and Atmospheric Administration, Columbia, Mo.
ESTIMATING SOLAR RADIATION FOR PLANT SIMULATION MODELS
Tom Hodges, Vikki French, and Sharon LeDuc Jan. 1985 23 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E85-10089; NASA-CR-175524; YM-15-00403; JSC-20239; NAS 1.26:175524) Avail: NTIS HC A02/MF A01 CSCL 02C

Five algorithms producing daily solar radiation surrogates using daily temperatures and rainfall were evaluated using measured solar radiation data for seven U.S. locations. The algorithms were compared both in terms of accuracy of daily solar radiation estimates and terms of response when used in a plant growth simulation model (CERES-wheat). Requirements for accuracy of solar radiation for plant growth simulation models are discussed. One algorithm is recommended as being best suited for use in these models when neither measured nor satellite estimated solar radiation values are available. A.R.H.

N85-21752*# California Univ., Berkeley. Space Sciences Lab.
REMOTE SENSING RESEARCH FOR AGRICULTURAL APPLICATIONS Progress Report, 1 Feb. 1983 - 31 Dec. 1984
Robert N. Colwell, Principal Investigator, Sharon L. Wall, Louisa H. Beck, Stephen D. DeGloria, Paul R. Ritter, Randall W. Thomas, Anthony J. Travios, and Emmanuel Fakhoury (California Univ., Davis) 31 Dec. 1984 60 p refs ERTS
(Contract NCC2-205)
(E85-10090; NASA-CR-175525; NAS 1.26:175525) Avail: NTIS HC A04/MF A01 CSCL 02C

Materials and methods used to characterize selected soil properties and agricultural crops in San Joaquin County, California are described. Results show that: (1) the location and widths of TM bands are suitable for detecting differences in selected soil properties; (2) the number of TM spectral bands allows the

quantification of soil spectral curve form and magnitude; and (3) the spatial and geometric quality of TM data allows for the discrimination and quantification of within field variability of soil properties. The design of the LANDSAT based multiple crop acreage estimation experiment for the Idaho Department of Water Resources is described including the use of U.C. Berkeley's Survey Modeling Planning Model. Progress made on Peditor software development on MIDAS, and cooperative computing using local and remote systems is reported as well as development of MIDAS microcomputer systems. A.R.H.

N85-21753*# City Coll. of the City Univ. of New York. Inst. of Marine and Atmospheric Sciences.
OCEANOGRAPHIC AND METEOROLOGICAL RESEARCH BASED ON THE DATA PRODUCTS OF SEASAT Final Technical Report
Willard J. Pierson, Jr. Mar. 1985 21 p refs ERTS
(Grant NAGw-266)
(E85-10091; NASA-CR-175526; NAS 1.26:175526) Avail: NTIS HC A02/MF A01 CSCL 05B

Reservations were expressed concerning the sum of squares wind recovery algorithm and the power law model function. The SAS sum of squares (SOS) method for recovering winds from backscatter data leads to inconsistent results when V pol and H pol winds are compared. A model function that does not use a power law and that accounts for sea surface temperature is needed and is under study both theoretically and by means of the SASS mode 4 data. Aspects of the determination of winds by means of scatterometry and of the utilization of vector wind data for meteorological forecasts are elaborated. The operational aspect of an intermittent assimilation scheme currently utilized for the specification of the initial value field is considered with focus on quantifying the absolute 12-hour linear displacement error of the movement of low centers. A.R.H.

N85-21754*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
BUILDING A FUNCTIONAL, INTEGRATED GIS/REMOTE SENSING RESOURCE ANALYSIS AND PLANNING SYSTEM
Merrill K. Ridd and Douglas J. Wheeler [1985] 2 p Sponsored by NASA ERTS
(E85-10092; NASA-CR-175527; NAS 1.26:175527) Avail: NTIS HC A02/MF A01 CSCL 05B

To be an effective tool for resource analysis and planning, a geographic information system (GIS) needs to be integrated with a digital remote sensing capability. To be truly functional, the paired system must be driven by grass roots local needs. A case study couched in a Soil Conservation District in northern Utah is presented. Agency representatives determined that the most fundamental data sets to be entered into the GIS system analysis system in the first round were: land use/land cover; geomorphic/soil unit data; hydrologic unit data; and digital terrain. The least expensive and best ways to obtain these data were determined. Data were acquired and formatted to enter the state's PRIME/ARC-INFO GIS, and are being interrogated for resource management decisions related to such issues as agricultural preservation, urban expansion, soil erosion control, and dam siting. A.R.H.

N85-21755*# Rochester Inst. of Tech., N. Y. Coll. of Graphic Arts and Photography.
LANDSAT 4 BAND 6 DATA EVALUATION Quarterly Report
15 Mar. 1985 4 p ERTS
(Contract NAS5-27323)
(E85-10093; NASA-CR-175528; NAS 1.26:175528; QR-10) Avail: NTIS HC A02/MF A01 CSCL 05B

Comparison of underflight data with satellite estimates of temperature revealed significant gain calibration errors. The source of the LANDSAT 5 band 6 error and its reproducibility is not yet adequately defined. The error can be accounted for using underflight or ground truth data. When underflight data are used to correct the satellite data, the residual error for the scene studied was 1.3K when the predicted temperatures were compared to measured surface temperature. A.R.H.

N85-21756*# Arizona Univ., Tucson. Optical Sciences Center.
SPECTRORADIOMETRIC CALIBRATION OF THE THEMATIC MAPPER AND MULTISPECTRAL SCANNER SYSTEM Quarterly Report, 1 Nov. 1984 - 28 Feb. 1985
James M. Palmer and Philip N. Slater, Principal Investigators
28 Feb. 1985 43 p refs ERTS
(Contract NAS5-27382)
(E85-10094; NASA-CR-175529; NAS 1.26:175529; QR-9) Avail: NTIS HC A03/MF A01 CSCL 08B

The effects of the atmosphere on propagating radiation must be known in order to calibrate an in orbit sensor using ground based measurements. A set of model atmosphere parameters, applicable to the White Sands (New Mexico) area is defined with particular attention given to those parameters which are required as input to the Herman Code. The radial size distribution, refractive index, vertical distribution, and visibility of aerosols are discussed as well as the molecular absorbers in the visible and near IR wavelength which produce strong absorption lines. Solar irradiance is also considered. A.R.H.

N85-21757*# EROS Data Center, Sioux Falls, S. Dak.
LANDSAT 4 INVESTIGATIONS OF THEMATIC MAPPER AND MULTISPECTRAL SCANNER APPLICATIONS Quarterly Report
Donald T. Lauer, Principal Investigator 27 Feb. 1985 3 p ERTS
(NASA Order S-10757-C)
(E85-10095; NASA-CR-175530; NAS 1.26:175530;
PCN902-91548) Avail: NTIS HC A02/MF A01 CSCL 05B

Structural and stratigraphic characteristics of the Drum Mountains in Utah were obtained using LANDSAT 5 TM data that were digitally enhanced using band ratioing, principal components analysis, and spatial filtering techniques. Color ratioing composite images proved most useful for distinguishing between and identifying exposure of hyroxly bearing hydrothermally altered inclusive rocks and bleached contact metamorphic rocks dominated by calc-silicate mineral assemblages. The amount and detail of geologic information interpreted from TM images is more significant than that from MSS and in geologic maps. Enhanced LANDSAT 5 TM data also identified and mapped hydrothermal alteration and distinguished between altered and unaltered limonitic assemblages in the Tonopath, Nevada quadrangle. A.R.H.

N85-21758*# Washington Univ., Seattle. NASA Science Working Group for the Special Sensor Microwave Imager (SSM/I).
PASSIVE MICROWAVE REMOTE SENSING FOR SEA ICE RESEARCH
Dec. 1984 69 p refs Sponsored by NASA Original contains color illustrations
(NASA-CR-175570; NAS 1.26:175570) Avail: NTIS HC A04/MF A01 CSCL 08L

Techniques for gathering data by remote sensors on satellites utilized for sea ice research are summarized. Measurement of brightness temperatures by a passive microwave imager converted to maps of total sea ice concentration and to the areal fractions covered by first year and multiyear ice are described. Several ancillary observations, especially by means of automatic data buoys and submarines equipped with upward looking sonars, are needed to improve the validation and interpretation of satellite data. The design and performance characteristics of the Navy's Special Sensor Microwave Imager, expected to be in orbit in late 1985, are described. It is recommended that data from that instrument be processed to a form suitable for research applications and archived in a readily accessible form. The sea ice data products required for research purposes are described and recommendations for their archival and distribution to the scientific community are presented. B.G.

N85-21759*# RCA Advanced Technology Labs., Camden, N. J. Government Systems Div.
MONOLITHIC SHORT WAVE INFRARED (SWIR) DETECTOR ARRAY
Jun. 1983 171 p refs
(Contract NAS5-27800)

(NASA-CR-175284; NAS 1.26:175284) Avail: NTIS HC A08/MF A01 CSCL 14B

A monolithic self-scanned linear detector array was developed for remote sensing in the 1.1- 2.4-micron spectral region. A high-density IRCCD test chip was fabricated to verify new design approaches required for the detector array. The driving factors in the Schottky barrier IRCCD (Pdsub2Si) process development are the attainment of detector yield, uniformity, adequate quantum efficiency, and lowest possible dark current consistent with radiometric accuracy. A dual-band module was designed that consists of two linear detector arrays. The sensor architecture places the floating diffusion output structure in the middle of the chip, away from the butt edges. A focal plane package was conceptualized and includes a polycrystalline silicon substrate carrying a two-layer, thick-film interconnecting conductor pattern and five epoxy-mounted modules. A polycrystalline silicon cover encloses the modules and bond wires, and serves as a radiation and EMI shield, thermal conductor, and contamination seal. E.A.K.

N85-21760# Michigan State Univ., East Lansing. Dept. of Geography.

DESIGN ISSUES IN VIDEO DISC MAP DISPLAY Final Report

J. M. Olson Oct. 1984 69 p

(Contract DAAG29-81-D-0100)

(AD-A149646; ETL-0362) Avail: NTIS HC A04/MF A01 CSCL 08/2

Video disc display of maps is a very recent phenomenon. Design issues with this form of display include those dealing with the map itself, those dealing with the disc, and those dealing with the hardware and software system. If topographic maps are designed especially for video disc, they should be designed such that the desired amount of earth area will fall within about a 3.75 x 5 cm map size, which is the area of a graphic image at normal reading distance that can be resolved on a standard television monitor. Other maps, such as simple base maps and relief maps, may be captured in larger sections. Video maps should be proofed in video form, i.e., examined using a video camera. Potential design features would include sheet overlap such that there would be no seams in images, legends that fit the width of monitors, and so on. If existing maps are captured on discs, there are also numerous design considerations. They include modification of the existing map so very small symbolism is brought to readable form, and design of the disc itself such that positive features of disc technology are utilized while the pitfalls are avoided (such as attempting to capture too large an area). Much of the design development work will depend upon pragmatic procedures for improving design. Items warranting careful experimental work include user abilities to deal with the equivalent of small map portions, the overlap problem, and the matter of how maps at different scales should be designed to be recognizable as portraying the same area at a different scale. A working list of existing map discs is included in an appendix. Author (GRA)

N85-21761# Admiralty Research Establishment, Portland (England).

THE IMAGING OF INTERNAL WAVES BY THE SEASAT-A SYNTHETIC APERTURE RADAR

M. M. Bagg and K. I. Johnson Aug. 1984 34 p

(AD-A149808; ARE/TN-720/84; DRIC-BR-93397) Avail: NTIS HC A03/MF A01 CSCL 08/3

This paper presents results derived from a study of some 5 million square kilometers of optical survey processed SEASAT-SAR imagery of the northeast Atlantic. In the study, markings attributed to internal wave activity were collected on maps together with the relevant bathymetry and surface meteorology. Simple analysis techniques have been applied systematically to compare the very large data sets involved. The characteristics of the internal wave features are also discussed. A small portion of the imagery is studied and discussed in greater detail as a case study. GRA

N85-21762# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

COMPUTER-AIDED STRUCTURAL ENGINEERING (CASE) PROJECT. SEEPAGE ANALYSIS OF CONFINED FLOW PROBLEMS BY THE METHOD OF FRAGMENTS (CFRAG) Final Report

M. E. Pace, R. Mosher, D. R. Williams, and T. F. Wolff Sep. 1984 112 p

(AD-A150015; WES/IR/K-84-8) Avail: NTIS HC A06/MF A01 CSCL 08/8

The method of fragments is an approximate analytical procedure for computing groundwater flow. Principal assumptions used in the derivation of this method are: the flow is confined and of finite depth. Darcy's law is valid and, therefore, laminar flow exists. A steady state flow exists. The soil medium is homogeneous and isotropic. Equipotential lines at certain locations of the flow region can be approximated by vertical lines. This report documents CFRAG, a computer program for seepage analysis of confined groundwater flow by the method of fragments. The program provides the following information: (1) flow per unit width through the specified soil medium; (2) head loss per fragment; (3) exit gradient; (4) the resultant uplift and lateral forces acting on the structure; and (5) a sketch of the structure with uplift and lateral pressure diagrams drawn appropriately. Data can be input by an interactive question-and-answer session, by a previously created data file, or by a pictorial menu using the crosshairs to select fragment types. The report presents example computer results with hand verification and example problems with comparisons made among the method of fragments, flownets, method of creep, and finite element analysis. It also presents a parametric study of a simple hydraulic structure to illustrate the effect on the solutions obtained by the various methods when the geometry of the structure is altered. GRA

N85-21763# Howard Associates, Inc., Owensboro, Ky.

WORKSHOP ON REMOTE SENSING/LINEAMENT APPLICATIONS FOR ENERGY EXTRACTION

J. F. Howard, ed., C. A. Komar, ed., and L. M. Cooper, ed. Apr. 1984 74 p refs Workshop held in Morgantown, W. Vir., 2 Dec. 1983

(DE84-009291; DOE/METC-84/9; CONF-831240) Avail: NTIS HC A04/MF A01

Six papers on the following topics are presented in this proceeding: (1) lineaments; (2) remote sensing/lineament analysis applications; (3) geologic controls on lineament systems, Pike County, Kentucky; (4) air-photo lineament domains in a portion of the Appalachian Basin; (5) subsurface anomalies expressed as lineaments in the northwest Pennsylvania portion of the Appalachian Plateau; and (6) effect of short lineaments on gas well yield from Devonian shales in eastern Kentucky. All papers have been processed for inclusion in the Energy Data Base. DOE

N85-21764# Oak Ridge National Lab., Tenn.

REVIEW OF COMPUTER MAPPING AND DISPLAY TECHNIQUES APPLICABLE TO REGIONAL ANALYSIS

R. C. Durfee Nov. 1984 37 p refs Presented at the DOE Transportation Colloq., Oak Ridge, Tenn., 27 Nov. 1984

(Contract DE-AC05-87CR-21400)

(DE85-003545; CONF-8411124-1) Avail: NTIS HC A03/MF A01

The concepts and methods associated with processing geographic data for regional analyses are introduced. Focus was upon describing the data structures for representing geographic features, techniques for digitizing data, various types of spatial transformations and analyses, geographic modeling, and graphic display in map form. Results from a variety of real-world applications were shown to aid in describing the techniques. Selection of data structures and spatial transformations to solve a particular geographic application will determine to a large extent the cost of digitizing data, performing the analyses, and the types of graphic displays available. The resolution of the data capture is also effected and the scale at which it can be used. The investigator must not only be familiar with the data elements used in analysis, but must be aware of what various thematic transformations on a spatial basis can do to the data. For example, the conversion of certain types of county-level data to watersheds based on proportionate area techniques can sometimes distort or smear-out

the distributions so that erroneous conclusions are made on a hydrologic basis. DOE

N85-21765# National Oceanic and Atmospheric Administration, Miami, Fla. Oceanographic and Meteorological Labs.
HYDROGRAPHIC DATA COLLECTED IN 1982 AND 1983 FOR EPOCS (EQUATORIAL PACIFIC OCEAN CLIMATE STUDIES)
C. Roffer, D. Behringer, and A. Leetmaa Aug. 1984 266 p refs
(PB85-110799; NOAA-TM-ERL-AOML-57) Avail: NTIS HC A12/MF A01 CSCL 08J

Hydrographic data were collected on four cruises during 1982 and 1983 for the EPOCS program. The data were recorded with a Neil Brown Instrument Systems CTD/02. Descriptions of the CTD/02 instrument, and data acquisition, processing and calibration techniques are given. Cruise tracks and station positions are shown. Profiles of temperature, salinity, sigma-t, and dissolved oxygen are plotted for each cast. GRA

N85-21766# National Geodetic Survey, Rockville, Md.
HYBRID METHOD OF MAPPING AND PHOTOGEODETIC CONTROL NETWORK DENSIFICATION
Ron Adler Oct. 1984 22 p refs
(PB85-133775; NOAA-TM-NOS-NGS-41) Avail: NTIS HC A02/MF A01 CSCL 08E

During the past few years, tremendous progress has been made in aerial triangulation by block adjustment with additional parameters. This method has achieved reliability and accuracy not considered possible only a decade ago. The paper postulates that photogeodetic control densification is economically viable, especially when performed in conjunction with well defined mapping tasks. Satellite geodesy, by means of the NAVSTAR Global Positioning System, is also discussed. This recently operational system is revolutionizing the approach to geodetic control densification by attaining survey results of centimeter level accuracy.
Author (GRA)

N85-21767# National Geodetic Survey, Rockville, Md.
ALONG-TRACK DEFLECTION OF THE VERTICAL FROM SEASAT: GEBCO (GENERAL BATHYMETRIC CHART OF THE OCEANS) OVERLAYS
David T. Sandwell Oct. 1984 14 p refs
(PB85-129641; NOAA-TM-NOS-NGS-40) Avail: NTIS HC A02/MF A01 CSCL 08E

To provide easy access to the large number of SEASAT altimeter observations, the National Geodetic Survey has produced overlays for the General Bathymetric Chart of the Oceans (GEBCO). Each of the 32 overlays displays along track deflection of the vertical for either ascending or descending altimeter passes. In poorly charted southern ocean areas the complete coverage by the SEASAT altimeter reveals many previously undetected features of the seafloor. Author (GRA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-21768* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR ENERGY CONVERTER USING SURFACE PLASMA WAVES Patent
Lynn M. Anderson, inventor (to NASA) Issued 13 Nov. 1984 7 p Filed 19 Apr. 1983 Supersedes N83-26258 (21 - 15, p 2430)
(NASA-Case-LEW-13827-1; NAS 1.71:LEW-13827-1; US-Patent-4,482,778; US-Patent-Appl-SN-486470; US-Patent-Class-136-246; US-Patent-Class-136-225; US-Patent-Class-357-30) Avail: US Patent and Trademark Office CSCL 10A

Sunlight is dispersed over a diffraction grating formed on the surface of a conducting film on a substrate. The angular dispersion controls the effective grating period so that a matching spectrum of surface plasmons is excited for parallel processing on the conducting film. The resulting surface plasmons carry energy to an array of inelastic tunnel diodes. This solar energy converter does not require different materials for each frequency band, and sunlight is directly converted to electricity in an efficient manner by extracting more energy from the more energetic photons.
Official Gazette of the U.S. Patent and Trademark Office

N85-21769* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR POWERED ACTUATOR WITH CONTINUOUSLY VARIABLE AUXILIARY POWER CONTROL Patent
Frank J. Nola, inventor (to NASA) Issued 18 Dec. 1984 6 p Filed 6 May 1982 Supersedes N82-26780 (20 - 17, p 2426)
(NASA-Case-MFS-25637-1; NAS 1.71:MFS-25637-1; US-Patent-4,489,243; US-Patent-Appl-SN-375684; US-Patent-Class-307-64; US-Patent-Class-307-66; US-Patent-Class-318-46; US-Patent-Class-318-729; US-Patent-Class-290-1R; US-Patent-Class-290-4R) Avail: US Patent and Trademark Office CSCL 10A

A solar powered system is disclosed in which a load such as a compressor is driven by a main induction motor powered by a solar array. An auxiliary motor shares the load with the solar powered motor in proportion to the amount of sunlight available, is provided with a power factor controller for controlling voltage applied to the auxiliary motor in accordance with the loading on that motor. In one embodiment, when sufficient power is available from the solar cell, the auxiliary motor is driven as a generator by excess power from the main motor so as to return electrical energy to the power company utility lines.
Official Gazette of the U.S. Patent and Trademark Office

N85-21770# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
A SUMMARY AND ASSESSMENT OF HISTORICAL RELIABILITY AND MAINTAINABILITY DATA FOR SOLAR HOT WATER AND SPACE CONDITIONING SYSTEMS
Gary J. Jorgensen May 1984 73 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004521; SERI/TR-253-2120) Avail: NTIS HC A04/MF A01

A number of government-sponsored programs were instituted specifically aimed at demonstrating the feasibility of using solar heating and cooling in residential and commercial buildings. A number of public utilities across the country also initiated residential solar energy programs. Although some attempts were made to gather reliability and maintainability (R&M) data, this was often done as a secondary effort in a performance study. It is the purpose of this report to consolidate the findings of previous R&M studies into a single document and thereby draw conclusions regarding R&M issues based on the combined data. Twenty applicable R&M studies are identified and summarized. Failure rates and problem frequencies are emphasized rather than guidelines and experiences that have been compiled elsewhere. R&M issues concerning solar energy systems, subsystems, and components are reviewed. The majority of R&M data discussed deals with liquid systems for solar domestic hot water applications. B.W.

N85-21771# Midwest Research Inst., Golden, Colo.
DIRECT-CONTACT CONDENSERS FOR SOLAR POND POWER PRODUCTION
Elizabeth M. Fisher and John D. Wright May 1984 77 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004510; SERI/TR-252-2164) Avail: NTIS HC A05/MF A01

The use of direct-contact condensers in a solar pond Rankine cycle is evaluated. The system of interest is a power plant in which the working fluid (pentane) is boiled by brine from the storage layer of the solar pond and condensed by brine from the evaporating pond that provides concentrated replacement brine to the solar pond. Three possible direct-contact condenser designs are considered: drop-type, bubble-type, and packed-bed. Size and cost are estimated for each direct-contact condenser and the accompanying deaerator and degasser. B.W.

N85-21772# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
AN INVESTIGATION OF AEROWINDOWS FOR SOLAR RECEIVERS Final Report
4 May 1984 45 p refs
(Contract DE-AC03-83SF-11693)
(DE84-010931; MSNW-C-13-259-01) Avail: NTIS HC A03/MF A01

Aerodynamic windows have the potential of increasing the efficiency of central solar receivers by as much as 10 efficiency points. An aerowindow consists of a transparent gas stream injected across the receiver aperture to isolate its interior from the surrounding atmosphere. Aerowindows reduce convective losses from an open receiver aperture and can eliminate reflection, convection, and reradiation losses from a comparable glass window. Receiver efficiency is modeled for open aperture receivers, glass windowed receivers, and aerowindow receivers in order to evaluate their relative merits. The net energy savings for the aerowindow solar receiver is calculated from this model and used to compute the payback period for various receiver and cost conditions. The flow, heat transfer, and economic models are detailed. Results of computer calculations for the aerowindow solar receiver are presented. A.R.H.

N85-21773# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
INTERNATIONAL CONGRESS CENTRUM BERLIN REPORT ON PHOTOVOLTAICS Status Report [STATUSBEREICHT PHOTOVOLTAIC]
Thomas Lanz, ed. Munich Deutsche Gesellschaft fuer Sonnenergie e.V. 1984 423 p refs In GERMAN; ENGLISH summary Congr. held at Berlin, 10-11 Sep. 1984 Original contains color illustrations
Avail: NTIS HC A18/MF A01

Crystallization methods for solar cell silicon; materials refining for solar cell silicon; flat-plate silicon for solar cells; carbothermic production of silicon solar cells using high-purity starting materials; and a silicon band spraying technique for solar cells are treated. The development of silicon nitride materials for the casting of solar cell silicon, and the optimization of silicon-nitride-inversion-layer solar cells are discussed. Large-size fine-granular graphite for solar techniques; prototype energy supply units; photovoltaic solar components; photovoltaic roofing tile systems; and process technologies for solar cells with high efficiency starting from purified silicon are presented. Optical properties of solar elements, pin solar cells made of amorphous silicon (a-Si), an a-Si panel, a-Si solar cell production processes, plasmachemical preparation and doping of a-Si, production and characterization of a-Si:H as base material for solar cells, and thin-film solar cells from sputtered and evaporated a-Si are treated. For individual titles, see N85-21774 through N85-21797.

N85-21774# Heliotronic G.m.b.H., Burghausen (West Germany).
CRYSTALLIZATION METHODS FOR SOLAR CELL SILICON [KRISTALLISATIONSVERFAHREN FUER SOLAR-SILICIUM]
D. Helmreich *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 1-20 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Silicon crystallization technologies for terrestrial photovoltaic applications are presented. The SILSO process for the production of ingot and the ramp assisted foil casting technique (RAFT) for the direct production of silicon disks are described and the characteristics of the resulting materials are discussed. In SILSO melting and crystallization take place in separate containers, which facilitates the reuse of the ingot molds. The RAFT methods seems to be an ideal combination between high output and good material quality. Author (ESA)

N85-21775# Heliotronic G.m.b.H., Burghausen (West Germany).
MATERIALS REFINING FOR SOLAR CELL SILICON [MATERIALRAFFINATION FUER SOLAR-SILICIUM]
J. Dietl *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 21-40 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Metallurgical refining processes for the production of solar cell silicon are described. The aim is to obtain an optimum purification effect with a minimum of process steps. The characterization of refined silicon is limited to chemical purity and its correlation with solar quality. Hydrometallurgical refining and pyrometallurgical refining (liquid-liquid extraction, liquid-gas extraction, and recrystallization in aluminum) are treated. Author (ESA)

N85-21776# Siemens A.G., Munich (West Germany). Forschungslab.
FLAT-PLATE SILICON FOR SOLAR CELLS [FLAECHENSILIZIUM FUER SOLARZELLEN]
B. Grabmeier *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 41-56 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Flat-plate silicon production methods for solar cell applications were investigated. The results obtained with the S-weaving technique and the recrystallization technique are described. The produced flat-plate silicon material is suited for further processing to solar cells. The optimization of the single process steps, especially the purification of the carbon fiber phase in the S-weaving technique, promises essential efficiency improvements. Theoretical studies and experiments demonstrate that a higher flat-plate throughput is possible. The Si-electrolyte-contact method, developed for a simple and fast characterization of Si-samples, is presented. Author (ESA)

N85-21777# Siemens A.G., Munich (West Germany).
CARBOTHERMIC PRODUCTION OF SILICON SOLAR CELLS USING HIGH-PURITY STARTING MATERIALS [CARBOTHERMISCHE HERSTELLUNG VON SOLAR-SILIZIUM MIT HOCHREINEN AUSGANGSMATERIALIEN]
H. Aulich and W. Dietze *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 57-71 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

A method for the production of highly pure, cheap silicon dioxide and carbon is described. The fiber leaching method, the production of high-purity SiO_2 starting from hexafluorosilicates, and the development of analytical investigation methods are discussed. The granulation of the starting substances and the final cleaning of carbon black; the reduction of SiO_2 in the laboratory light arc furnace; tests conducted in a 550 kVA pilot light arc furnace; and the mold casting of silicon are described. The carbothermic reduction tests show high-purity silicon can be obtained from high-purity starting substances under the cleanest conditions. This method can lead to the production of cheap solar cell silicon. Author (ESA)

N85-21778# Vacuumschmelze G.m.b.H., Hanau (West Germany).
SILICON BAND SPRAYING TECHNIQUE FOR SOLAR CELLS [SILIZIUM-BANDSPRITZTECHNIK FUER SOLARZELLEN]
W. Grimm *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 73-84 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The band spraying technique for the direct production of thin and large surface material in the form of disks, plates or bands is discussed. Liquid Si is directly sprayed from the melting tank onto the cooling surface, solidifying to a thin band. The method fulfills the basic requirements of high surface velocity in the production of Si-bands for solar cells. The obtained crystal quality and free surface roughness are not sufficient for solar cell production. However, the basic concept allows substantial improvements.
Author (ESA)

N85-21779# Elektroschmelzwerk Kempten G.m.b.H., Munich (West Germany).
DEVELOPMENT OF SILICON NITRIDE MATERIALS FOR THE CASTING OF SOLAR CELL SILICON [ENTWICKLUNG VON SILICIUMNITRIDWERKSTOFFEN ZUM VERGIESSEN VON SOLARZELLEN-SILICIUM]
K. Hunold and P. Matje *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 85-101 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The casting of solar cell silicon from Si3N4 is discussed. The transformation of molded bodies of high purity silicon to silicon nitride succeeds up to a conversion degree of > 95 %. The amount of pressure applied during cold forming and the granulation band of the starting powder decisively affect the density, the structure, and the corrosion behavior of the Si3N4-casting material. Addition of Si3N4-powder to the starting silicon improves nitrifiability of the molded body, but does not give satisfactory results due to the bad thermal shock behavior. A fine-grain, fine-pored structure of the casting material shows the best results during the tests.
Author (ESA)

N85-21780# Ringsdorff-Werke G.m.b.H., Bonn (West Germany).
LARGE-SIZE FINE-GRANULAR GRAPHITE FOR SOLAR TECHNIQUES [GROSSFORMATIGER FEINKORNGRAPHIT FUER DIE SOLARTECHNIK]
W. Ulsamer and H. Persicke *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 103-120 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Large-size fine-grain graphite blocks with diameters up to 600 mm were tested in the directions parallel and perpendicular to the block diameter with and without secondary compression. It is shown that the requirements concerning gross density (minimum 1.8 g/cucm) and open porosity (maximum 10 %) are fulfilled by all materials concepts in secondary compression state. The characteristics of graphite materials guarantee impermeability against the Si-melt, sufficient mechanical strength to handle larger melts, low contamination of the melt by foreign elements, and high lifetime of the graphite component at relevant working temperatures in the range between 166 and 1700 C. Author (ESA)

N85-21781# AEG-Telefunken, Heilbronn (West Germany).
DEVELOPMENT AND PROTOTYPE CONSTRUCTION OF PHOTOVOLTAIC ENERGY SUPPLY UNITS [ENTWICKLUNG UND PROTOTYPENBAU VON PHOTOVOLTAISCHEN ENERGIEVERSORGUNGSANLAGEN]
K. H. Korupp, G. Koscielny, G. Neuhaeusser, H.-D. Wegmann, and K. Roy *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 121-173 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Status of technical developments in the field of photovoltaic energy supply systems is described. Materials investigations for the production of solar cells (materials characterization, optimization of the cell production process, method for the optimization of cell characteristics, comparison of solar cells from single and polycrystalline Si), the development of cheap production methods for solar cells, and the production of model and prototypes are treated. For solar generators, cell connection techniques; embedding techniques; estimation and contact techniques; measuring techniques; tests of modules and their components; the development of production methods; the construction of production test facilities; and prototype construction are treated. Photovoltaic systems concepts; techniques for grid-coupled solar systems; and field tests are described.
Author (ESA)

N85-21782# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
PHOTOVOLTAIC SOLAR COMPONENTS [PHOTOVOLTAISCHE SOLARBAUELEMENTE]
K. Bednorz, F. Cammerer, and H.-D. Hecht *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 175-188 In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Photovoltaic solar components based on silicon were studied to develop a cheap method for the production of solar cells and solar modules for terrestrial applications in nonconcentrated systems. Plasma doping, screen printing, flame spraying, integrable bypass diodes, and partially stiffened modules were investigated. The broadening of the solar module spectrum and the realization of the highest possible production efficiency are discussed. Cells and modules made of D-silicon were produced with substantial cost reduction.
Author (ESA)

N85-21783# BMC Acrylchemie G.m.b.H., Wermelskirchen (West Germany).
PHOTOVOLTAIC ROOFING TILE SYSTEMS [PHOTOVOLTAIC DACHSTEINSYSTEME]
B. Melchior *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 189-200 In GERMAN Original contains color illustrations (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The integration of photovoltaic (PV) systems in architecture is discussed. A PV-solar roofing tile system with polymer concrete base; PV-roofing tile with elastomer frame profiles and aluminum profile frames; contact technique; and solar cell modules measuring technique are described. Field tests at several places were conducted on the solar generator, electric current behavior, battery station, electric installation, power conditioner, solar measuring system with magnetic bubble memory technique, data transmission via telephone modems, and data processing system. The very favorable response to the PV-compact system proves the commercial possibilities of photovoltaic integration in architecture.
Author (ESA)

N85-21784# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaft 6.
OPTIMIZATION OF SILICON-NITRIDE-INVERSION LAYER SOLAR CELLS [OPTIMIERUNG DER SILIZIUMNITRID-INVERSIONSSICHT-SOLARZELL]
R. Hezel *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 201-210 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Investigations for the development of SiN-inversion-layer solar cells are reviewed. Plasma-SiN-layers produced in a plasma reactor are characterized, especially concerning the increase of positive charges by the insertion of cesium, reproducibility, and stability. It is shown that for MIS-contacts aluminum can be deposited on silicon by electron beam evaporation. The effects of the insertion of cesium in the SiN-layer on the solar cell data were investigated; it is shown that a substantial process simplification is obtained together with an efficiency increase.
Author (ESA)

N85-21785# Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg (West Germany).
DEVELOPMENT OF NEW PROCESS TECHNOLOGIES FOR SOLAR CELLS WITH HIGH EFFICIENCY STARTING FROM PURIFIED SILICON [ENTWICKLUNG NEUER PROZES-

STECHNOLOGIEN FUER SOLARZELLEN MIT HOHEM WIRKUNGSGRAD AUS UNKONVENTIONELL GEREINIGTEM SILIZIUM]

A. Goetzberger and B. Voss *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berling Rept. on Photovoltaics 1984 p 211-227 In GERMAN (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

Technologies to getter foreign atoms in silicon were studied. The combination of different gettering processes provides the fundamentals to use conventionally purified silicon material for solar cells with high efficiency. Three methods were used to determine the diffusion length of the charge carriers, i.e., surface-photovoltage, light-beam-induced-current, and electron-beam-induced-current. Tests with gettering technologies on solar-grade material show that a clear increase of the efficiency is obtained, which is however still substantially lower than that of standard SILSO-material. Author (ESA)

N85-21786# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).

INVESTIGATION OF THE OPTICAL PROPERTIES OF SOLAR ELEMENTS [UNTERSUCHUNG DER OPTISCHEN EIGENSCHAFTEN VON SOLARELEMENTEN]

K. Bischoff, H. Kaase, and J. Metzdorf *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlim Rept. on Photovoltaics 1984 p 229-237 refs In GERMAN (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

A two beam method to measure the differential spectral sensitivity of solar elements is described. It is suited for the calibration and characterization of photovoltaic elements. Investigations of the sensitivity of mono and polycrystalline photovoltaic Si-solar elements show systematic nonlinearities in elements with p-doped base. The sensitivity increase is an effect of the base region which is linked to the photoinduced increase of the diffusion length in the base, and can be explained by the occupation of traps. Author (ESA)

N85-21787# Siemens A.G., Munich (West Germany). Forschungslaboratorium.

PIN SOLAR CELLS MADE OF AMORPHOUS SILICON [PIN-SOLARZELLEN AUS AMORPHEM SILIZIUM]

R. D. Plaettner and W. W. Kruehler *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlim on Photovoltaics 1984 p 239-258 refs In GERMAN Original contains color illustrations (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

Investigations leading to solar cells with a structure SnO2-pin and an efficiency up to 9.8% are reviewed. The production of large-surface metal/pin/transparent conductive oxide (TCO)-solar cells is discussed. A two-chamber reactor, grid structure and tinning of cells, and an a-Si-module are described. The production of glass/TCO/pin/metal-solar cells and a-SiGe:H-compounds is outlined. Measurements on solar cells and diodes including the efficiency of a-Si:H-solar cells, spectral sensitivity, diffusion lengths, field effect measurements, and modifications of solar cells (space-charge limited currents, reduction of solar cells aging) are treated. Author (ESA)

N85-21788# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

DEVELOPMENT OF AN AMORPHOUS SILICON PANEL [ENTWICKLUNG EINES AMORPHEM SILIZIUM-PANEELS]

N. Kniffler, G. Mueck, M. Simon, and G. Winterling *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 259-276 refs In GERMAN Original contains color illustrations (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

Solar cell degradation and reproducibility of cell production were investigated to develop an a-Si-panel. In order to improve deposition of a-Si, a reactor with wet chamber for the deposition of layers with pin-structure was built. Cell diagnostics were improved and experiments on the series connection in thin film technology were started. Improved degradation behavior of a-Si cells is obtained. The cell properties are sufficient for low power applications. Author (ESA)

N85-21789# AEG-Telefunken, Frankfurt am Main (West Germany). Forschungsinst.

AMORPHOUS SILICON SOLAR CELLS WITH A VIEW TO CHEAP PRODUCTION PROCESSES [AMORPHE SILIZIUM-SOLARZELLEN IM HINBLICK AUF KOSTENGUENSTIGE]

R. Fischer, H. W. Grueninger, and E. Niemann *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 277-291 refs In GERMAN (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

The photovoltaic properties of a-Si thin-film cells and cheap production and processing methods on laboratory scale were investigated. Measurements on pin solar cells, and roughened substrates were performed. A transparent antireflection coating with good conductivity was applied. The bonding technique is found to be satisfactory. Author (ESA)

N85-21790# Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronic.

PLASMACHEMICAL EVAPORATION AND DOPING OF AMORPHOUS SILICON [PLASMACHEMISCHE PRAEPARATION UND DOTIERUNG VON AMORPHEM SILIZIUM]

G. H. Bauer, G. Bilger, H.-D. Mohring, C. E. Nebel, S. M. Paasche, and W. H. Bloss *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 293-306 refs In GERMAN (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

A plasmachemical method for the doping of amorphous silicon was developed. Amorphous silicon from the dc glow discharge and the RF sputtering is doped by alternative methods for the injection of several elements from the third and fifth group of the periodic system into the plasma. Analysis of the electronic properties show that only B is suited for p-doping and that P, As, Sb are useful for n-doping of amorphous Si. A continuous shift of the optical energy gap towards energies up to > 3.0 eV is obtained by the insertion of C or N in the amorphous lattice. Compared to a-Si-N:H films, a-SiC:H films show a lower defect density in the band tails and in the band middle. The shift of the optical energy gap towards lower energies succeeds with amorphous mixed semiconductor SiGe up to 1.1 eV and with SiSn up to 0.7 eV. Author (ESA)

N85-21791# Marburg Univ. (West Germany). Fachbereich Physik.

PRODUCTION AND CHARACTERIZATION OF AMORPHOUS SILICON (a-Si:H) AS BASE MATERIAL FOR SOLAR CELLS [HERSTELLUNG UND CHARAKTERISIERUNG VON AMORPHEM SILIZIUM (A-Si:H) ALS BASISMATERIAL FUER SOLARZELLEN]

W. Fuhs and H. Mell *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 307-319 refs In GERMAN (For primary document see N85-21773 12-44)

Avail: NTIS HC A18/MF A01

Use of a-Si:H in solar cells, including deposition; measuring methods to characterize defect states; structure and chemical analysis; recombination of the charges carriers; light-induced effects; and electronic properties of window materials is considered. The energy gap state density and the recombination mechanism in a-Si:H films are determined. Author (ESA)

N85-21792# Kaiserslautern Univ. (West Germany). Fachbereich Physik.

THIN-FILM SOLAR CELLS FROM SPUTTERED AND VAPOR-DEPOSITED AMORPHOUS SILICON [DUENNSCHICHTSOLARZ-

ELLEN AUS GESPUTTERTEM UND AUFGEDAMPFTEM AMORPHEM SILIZIUM]

W. Mueller, H. Ruebel, S. Iselborn, G. Arenas, C. Wagner, B. Schroeder, and J. Geiger *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 321-333 refs In GERMAN; ENGLISH summary (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The properties of sputtered and evaporated a-Si:H, and the application of this material for the preparation of solar cells were investigated. Correlations are found between the photoelectrical properties of the films and the amount and bonding configuration of the hydrogen incorporated, both influencing the film structure. Optimally passivated sputtered material containing 10 at % hydrogen is deposited for preparation of Schottky and pin-type solar cells. Conversion efficiencies > 2% are measured. A possible efficiency of 5% is calculated taking the best values obtained for cell parameters. Progress in the defect passivation of reactively evaporated a-Si:H films is reported. Author (ESA)

N85-21793# NUKEM G.m.b.H., Hanau (West Germany).
TESTING AND OPTIMIZATION OF THE PRODUCTION TECHNOLOGY OF LARGE-SURFACE Cu2S/CdS SOLAR GENERATORS [ERPROBUNG UND OPTIMIERUNG DER FERTIGUNGSTECHNOLOGIE GROSSFLAECHIGER CU2S/CDS-SOLARGENERATOREN]

G. H. Hewig *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 335-353 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

A production method for thin-film solar cells based on the heterotransition Cu2S/CdS was developed on laboratory scale. Single 7x7 sqcm cells with efficiencies up to 8% are obtained. The stability is demonstrated in accelerated tests by thermal cycling. The developed method is carried over to a pilot system with an outlined production capacity of 50 kWp1a; average efficiencies of 5.4% with peak values of up to 7% are obtained; solar modules show efficiencies up to 6%. Alternative front-contact systems were experimentally investigated; modules with efficiencies > 4% are produced with double-screen-printed front contacts.
Author (ESA)

N85-21794# Dortmund Univ. (West Germany).
PHYSICAL-CHEMICAL INVESTIGATIONS OF COPPER SULFIDES FOR USE IN CdS/Cu2S SOLAR CELLS [PHYSIKALISCH-CHEMISCHE UNTERSUCHUNGEN AN KUPFERSULFID IN HINSICHT AUF DESSEN VERHALTEN IN DER CDS-CU2-S-SOLARZELLEN]

H. Rickert, H. D. Wiemhoefer, and Ch. Filthaut *In* Bundesministerium fuer Forschung und Tehnologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 355-366 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The behavior of copper sulfide in contact with other materials was investigated to characterize the contact silver-copper sulfide. The knowledge of transport quantities in CuxS together with the results of current-voltage measurements contribute to the explanation of electrochemical processes in CuxS in solar cells. The stability behavior of the Cu2S/CdS solar cell also depends on the type of contact material; it is shown that solar cells with silver as contact material are stable. The current-voltage behavior and contact changes during heating were studied to explain the phenomena in the contact silver/copper sulfide. Results show that silver reacts with copper sulfide at high temperature and dissolves into copper sulfide which is affected in its electrochemical properties. Current-voltage measurements were performed on molybdenum and brass contacts on CuxS. Author (ESA)

N85-21795# Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronik.
DEVELOPMENT OF HIGH-EFFICIENCY ECONOMIC SYSTEMS FOR PHOTOVOLTAICS [ENTWICKLUNG VON HOCHEFFIZIENTEN UND WIRTSCHAFTLICHEN SYSTEMEN FUER DIE PHOTOVOLTAIC]

F. Pfisterer, H.-W. Schock, W. Arndt, G. Gordillo, J. Kimmerle, R. Menner, and W. H. Bloss *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 367-382 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Thin-film-tandem solar cells were developed. The potential of Cu2S CdS solar cells can be enlarged by the use of ZnCdS to increase efficiency. Tests to produce CuInSe2 CdS solar cells results in efficiency up to 5% for a total semiconductor film thickness of 4 microns. It is shown that the evaporation of CuInSe2 films poses no serious technological difficulties. Solar cells with large energy gap for tandem systems featuring heterotransitions with high open circuit voltage were built. A value of 1.3 V is obtained in the system ZnTe-ZnCdS. Very promising properties for the application as component of a tandem system are found in CuGaSe2. Author (ESA)

N85-21796# Battelle Inst., Frankfurt am Main (West Germany).
DEVELOPMENT OF A CdSe THIN FILM SOLAR CELL [ENTWICKLUNG EINER CDSE-DUENNERSCHICHT-SOLARZELLE]

E. Rickus and H. Richter *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 383-394 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

Thin-film CdSe solar cells were developed for large scale economic terrestrial photovoltaic energy production and properties of CdSe-ZnSe-Au thin film cells. Short circuit currents up to 80% of the theoretical value are obtained due to a close to one quantum yield in CdSe films with good column structure. In CdSe Te1-x cells chemical and crystallographic inhomogeneities are obstacles to further increase of the short current. Author (ESA)

N85-21797# Konstanz Univ. (West Germany). Fakultaet fuer Physik.
DEVELOPMENT OF NEW SOLAR CELLS [ENTWICKLUNG NEUER SOLARZELLEN]

E. Bucher, M. Ch. Lux-Steiner, P. Munz, I. Frankowski, U. Elrod, R. Spaeh, H. Keppner, T. Frey, S. Schulz, U. Gubler (Basel Univ.) et al *In* Bundesministerium fuer Forschung und Technologie Intern. Congr. Centrum Berlin Rept. on Photovoltaics 1984 p 395-415 refs In GERMAN (For primary document see N85-21773 12-44)
Avail: NTIS HC A18/MF A01

The properties of several solar cells were investigated. The Si-MIS cells were produced by evaporation and sputtering of the barrier metal. Higher efficiencies are obtained with low-resistance base material. Samples of silicon powder sintered by capacitive discharge were compared with the starting material. Results indicate the possibility of obtaining an efficient solar cell material. The properties of Zn3P2 and WSe2 were studied. Both were processed to produce MIS and homo and heterodiodes.
Author (ESA)

N85-21798# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
PERFORMANCE EVALUATION OF AN ACTIVE SOLAR COOLING SYSTEM UTILIZING LOW COST PLASTIC COLLECTORS AND AN EVAPORATIVELY-COOLED ABSORPTION CHILLER Final Report

George O. Lof, Mark A. Westhoff, and Susumu Karaki Washington, D.C. DOE Feb. 1984 130 p refs
(Contract DE-AC03-81CS-30569)
(DE84-010813; DOE/CS-30569/30) Avail: NTIS HC A07/MF A01

During the summer of 1982, air conditioning in Solar House 3 at Colorado State University was provided by an evaporatively-cooled absorption chiller. The single-effect lithium bromide chiller is an experimental three-ton unit from which heat is rejected by direct evaporative cooling of the condenser and absorber walls, thereby eliminating the need for a separate cooling tower. Domestic

hot water was also provided by use of a double-walled heat exchanger and 80-gal hot water tank. A schematic of the system is given. Objectives of the project were: (1) evaluation of system performance over the course of one cooling season in Fort Collins, Colorado; (2) optimization of system operation and control; (3) development of a TRNSYS compatible model of the chiller; and (4) determination of cooling system performance in several U.S. climates by use of the model. B.W.

N85-21799# Radiation Monitoring Devices, Inc., Watertown, Mass.
LOW COST, SPRAYED CuInSe2 SOLAR CELL RESEARCH Annual Progress Report, 15 Sep. 1983 - 15 Sep. 1984
M. R. Squillante, L. Moy, and G. Entine 1984 33 p refs
(Contract DE-AC02-82ER-13026)
(DE85-003467; DOE/ER-13026/3) Avail: NTIS HC A03/MF A01

Spray pyrolysis technique for depositing cost effective thin films of CuInSe2 for terrestrial solar cell applications is investigated. This process is attractive because of its inherent simplicity which should permit large scale production of high quality thin films at low cost. This program is directed at determining the chemical and physical conditions required to produce high quality films and at characterizing and understanding the properties of the films produced. The characteristics of solar cell devices fabricated using the sprayed films are discussed. The results are very encouraging but further work is needed to fully examine the use of this unique deposition process in the manufacturing of CuInSe2 solar cells. DOE

N85-21800# Midwest Research Inst., Golden, Colo.
EXPERIMENTAL STUDY OF STEAM CONDENSATION ON WATER IN COUNTERCURRENT FLOW IN PRESENCE OF INERT GASES
D. Bharathan and J. Althof Aug. 1984 13 p refs Presented at ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract DE-AC02-83CH-10093)
(DE84-013028; SERI/TP-252-2332; CONF-841201-18) Avail: NTIS HC A02/MF A01

Experimental results of investigating steam condensation on water in the presence of (noncondensable) inert gases at low temperatures and pressures relevant to open-cycle ocean thermal energy conversion (OTEC) systems are reported. Seven different condenser configurations were tested. The experimental data are correlated using a liquid flow fraction and a vent fraction to yield simple relationships of condenser performance over a wide range of test conditions. Performance maps and envelopes are provided for evaluating the relative merits of tested configurations. The height of transfer unit (HTU) for condensation ranges from 0.2 to 0.3 m among the various condenser geometries. Also reported are the pressure-loss coefficients for all the tested geometries. DOE

N85-21801# National Bureau of Standards, Washington, D.C.
NBS SOLAR COLLECTOR DURABILITY/RELIABILITY TEST PROGRAM Final Report
D. Waksman, W. C. Thomas, and E. R. Streed Sep. 1984 151 p Sponsored by DOE
(DE85-003489; NBS-TN-1196) Avail: NTIS HC A08/MF A01

Efforts in the development of reliability/durability tests for solar collectors and their materials have been hampered by the lack of real time conditions. Research undertaken at the National Bureau of Standards (NBS) to help generate the data required to develop methods for predicting the long term durability and reliability of flat plate solar collectors and their materials is discussed. Eight different types of flat plate solar collectors were exposed outdoors at four sites located in different climatic regions. Small scale cover and absorbed materials coupon specimens consisting of samples taken from a collector of each of the eight types used and a number of additional materials were exposed concurrently with the full size collectors. Periodic measurements were made of collector and materials performance as a function of outdoor exposure time. Indoor laboratory aging tests were conducted concurrently on specimens of the same materials to provide a basis for comparison with the outdoor exposure tests. The results obtained in this test program are presented. DOE

N85-21802# Sandia Labs., Albuquerque, N. Mex.
SOME SOLAR DISH/HEAT ENGINE DESIGN CONSIDERATIONS
R. L. Alvis Nov. 1984 17 p refs
(Contract DE-AC04-76DP-00789)
(DE85-003479; SAND-84-1698) Avail: NTIS HC A02/MF A01

Tradeoff decisions are an essential feature of solar dish/electric systems design. The often competing characteristics of the various subsystems require careful analysis before a designer can create an optimal performance, minimal cost final product. Discussed here are design factors such as the dish concentration ratio as a function of operating temperature; the module performance characteristics of Brayton, Rankine, and Stirling heat engines; hybrid operation economics; optimum module size; and thermodynamic effects. It is shown that for heat engines operating at 1370(0)C or above, the dish concentration ratio needs to be at least 2000 and the optimum dish diameter is between 14 m and 19 m. High engine efficiency as a result of increased temperature is shown to be not always desirable for solar modules. The second-law thermodynamic results indicate single insolation reflection is desired over the use of terminal concentrators or multiple reflections. DOE

N85-21803# Sandia Labs., Albuquerque, N. Mex.
SHALLOW MAGMA TARGETS IN THE WESTERN US
H. C. Hardee Oct. 1984 39 p refs
(Contract DE-AC04-76DP-00789)
(DE85-003274; SAND-83-1361) Avail: NTIS HC A03/MF A01

Within the next few years a hole will be drilled into a shallow magma body in the western US for the purpose of evaluating the engineering feasibility of magma energy. Potential drilling sites for these engineering feasibility experiments are examined. Target sites high on the list are ones that currently exhibit good geophysical and geological data for shallow magma and also have reasonable operational requirements. Top ranked sites for the first magma energy well are Long Valley, CA, and Coso/Indian Wells, CA. Kilauea, HI, also in the top group, is an attractive site for some limited field experiments. A number of additional sites offer promise as eventual magma energy sites, but sparsity of geophysical data presently prevents these sites from being considered for the first magma energy well. DOE

N85-21804# National Bureau of Standards, Boulder, Colo. Chemical Engineering Div.
THERMOPHYSICAL PROPERTIES OF WORKING FLUIDS FOR BINARY GEOTHERMAL CYCLES Final Report
D. E. Diller, J. S. Gallagher, B. Kamgar-Parsi, G. Morrison, J. M. H. Levelt-Sengers, J. V. Sengers, L. J. VanPoolen, and M. Waxman Jul. 1984 150 p refs Prepared in cooperation with Maryland Univ., College Park
(Contract DE-AT01-80RA-50241)
(DE85-000385; DOE/RA-50241/T1) Avail: NTIS HC A07/MF A01

Topics covered include: thermodynamic properties of isobutane and isobutane-isopentane mixtures; a scaled fundamental equation for mixtures of isobutane and isopentane near gas liquid critical line; and viscosities of hydrocarbons and their mixtures. DOE

N85-21805# Midwest Research Inst., Golden, Colo.
AERODYNAMIC RESEARCH EFFORTS AT SERI WIND ENERGY RESEARCH CENTER AT ROCKY FLATS
J. L. Tangler Oct. 1984 9 p refs Presented at European Wind Energy Conf. and Exhibition, Hamburg, 23 Oct. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000529; SERI/TP-217-2530; CONF-841071-2) Avail: NTIS HC A02/MF A01

Two levels of performance prediction theory are currently being used and refined while performance enhancement is being pursued through the development of new special purpose airfoils. A general purpose blade-element/momentum code (PROPSH) has been developed for rapid parametric studies and for use in annual energy calculations. A desirable feature of this code is a post-stall airfoil data synthesization routine that accounts for blade aspect ratio effects. A version of the performance code is also being developed

to provide a better determination of dynamic stall effects on blade loads and performance as influenced by machine yaw angle, unsteady winds, tower shadow, and wind shear. For detailed wind turbine blade optimization, a more sophisticated lifting-surface/prescribed-wake analysis has recently been developed. This computer code is a transfer of current state-of-the-art helicopter theory into a wind turbine design analysis. The special purpose airfoil design effort is directed toward satisfying the need to tailor airfoil characteristics specifically for HAWT's. The design criteria and the current status of this effort are presented. DOE

N85-21806# Oak Ridge National Lab., Tenn.
LATENT HEAT STORAGE TECHNOLOGY AND APPLICATION WORKSHOP. SUMMARY REPORT: SESSION 6
J. F. Martin 1984 3 p Presented at IEA Workshop on Latent Heat Stores, Stuttgart, 5 Mar. 1984
(Contract DE-AC05-84CR-21400)
(DE85-001097; CONF-8403146-5) Avail: NTIS HC A02/MF A01

Latent heat storage technology and application were studied. The economics of short term latent heat storage for application and system configuration were analyzed. Subjects discussed included: state of the art, solar energy stores, residential heating and cooling, and industrial and utility applications. E.A.K.

N85-21807# Oklahoma State Univ., Stillwater. Engineering Energy Lab.
RESEARCH ON MICROEMULSIONS FOR STORAGE AND CONVERSION OF SOLAR ENERGY Final Report
S. Holt 1984 12 p
(Contract DE-FG02-80ER-10794)
(DE85-000181; DOE/ER-10794/T1) Avail: NTIS HC A02/MF A01

Research is reported in: (1) the identification of norbornadiene/water/2-propanol and quadricyclane/water/2-propanol microemulsions; (2) the identification of a water continuous-oil dispersed microemulsion; (3) further characterization of the water/toluene/2-propanol water continuous microemulsion and the effects of surfactant upon the region boundaries; (4) the preparation and purification of the tetrasodium salt of tetra(p-sulfophenyl) porphinecobalt (II), CoTPPS; and (5) the development of synthetic organic techniques which would allow altering the hydrophobic/hydrophilic balance of porphyrins, orthophenanthrolines and bipyridines in order to allow development of sensitizers for the norbornadiene (YIELDS) quadricyclane conversion or catalysts for the back reaction which may have their location varied throughout either phase of a microemulsion. DOE

N85-21808# Houston Univ., Tex. Energy Lab.
USER'S MANUAL FOR THE UNIVERSITY OF HOUSTON INDIVIDUAL HELIOSTAT LAYOUT AND PERFORMANCE CODE
C. L. Laurence, F. W. Lipps, and L. L. VantHull Dec. 1984 235 p refs
(Contract DE-AC04-76DR-00789)
(DE85-004643; SAND-84-8187) Avail: NTIS HC A11/MF A01

The individual heliostat (IH) computer code which determines the location of heliostats for an optimized heliostat collector field and computes the performance of the central receiver system is discussed. For the IH code to generate optimized fields as specified by the cellwise optimization (RC) code, the IH code requires output from CELLAY. The CELLAY program is a stand-alone program that takes output from the RC system and generates input for the IH programs. A subroutine the LAYOUT, with its associated subroutines is the primary source of heliostat location coordinates. Boundaries, slip planes, and deletes are all controlled by specification of key variables which occur before the general sequence of calculations. The IH performance code is similar to the cellwise performance code (NS) with the sum over cells being replaced by a sum over heliostats. Each heliostat has several associated quantities which are calculated and printed so that the action of the system can be monitored over the course of time. Performance can be determined at any single point in time, or it can be integrated over daily, monthly, or annual performance periods. DOE

N85-21809# National Bureau of Standards, Washington, D.C. Center for Building Technology.
EVALUATION OF ETTRINGITE AND RELATED COMPOUNDS FOR USE IN SOLAR ENERGY STORAGE Progress Report
Leslie J. Struble and Paul W. Brown Oct. 1984 44 p refs
(Contract DE-AI01-76PR-06010)
(DE85-003249; NBSIR-84-2942) Avail: NTIS HC A03/MF A01

Ettringite and related phases were investigated for potential application in solar energy storage were investigated. The potential of ettringite dehydration and rehydration as a phase change process for energy storage were evaluated. Synthesis procedures were developed, and a number of ettringite-type phases were prepared. The heat capacity of each phase was approximately 0.3 calories per gram per degree Celsius. Studies of the dehydration of these phases at atmospheric pressure indicate that the material has good potential as a phase change material for solar energy storage. Dehydration occurred at temperatures in the range between approximately 30 C and 55 C, with changes in enthalpy ranging between 100 and 240 calories per gram of samples. Ettringite was found to have a reversible hydrothermal reaction at approximately 50 C, with an enthalpy change of approximately four calories per gram sample. DOE

N85-21810# National Bureau of Standards, Washington, D.C. Center for Building Technology.
MULTI-YEAR PLAN FOR EXPERIMENTAL SYSTEMS RESEARCH: PASSIVE AND HYBRID SOLAR ENERGY PROGRAM
Joseph Greenberg Nov. 1984 51 p
(Contract DE-AI01-76PR-06010)
(DE85-004698; NBSIR-84-2972) Avail: NTIS HC A04/MF A01

The development of a multiyear plan for experimental systems research to gain knowledge to advance the understanding of passive and hybrid solar energy technology is addressed. This understanding includes the ability to acquire building performance data under controlled conditions to study the fundamental mechanism of the driving forces that effect change, along with the resulting change. This information is basic for algorithm development defining relationships between the various physical elements which interact within a building and also in determining the accuracy of the various models and simulations developed for use in heating and cooling applications. The comprehensive planning effort undertaken to achieve a consensus regarding the research to be performed, the most appropriate facility to perform the research, and the funding requirements are reported. Included is the process whereby through a series of working meetings and exchange of correspondence, a list of candidate research areas are identified for both heating and cooling technologies. The report articulates the results and details the recommended experimental systems research activities for solar passive and hybrid technologies for FY85 and beyond. DOE

N85-21811# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HEAT CYCLE RESEARCH EXPERIMENTAL PROGRAM REPORT, FY-84
J. F. Whitbeck, ed. Sep. 1984 21 p refs Presented at the DOE Geothermal Technol. Conf., El Centro, Calif., 16 Oct. 1984
(Contract DE-AC07-76ID-01570)
(DE85-003558; EGG-M-23484; CONF-8410179-2) Avail: NTIS

The Heat Cycle Research Facility (HCRF) is an experimental binary-cycle facility used to investigate different concepts and/or components for generating electrical power from a geothermal resource. The Heat Cycle Research Facility in which the various tests are conducted is described, the test program outlined and the results obtained from the experimental program to date discussed. DOE

N85-21812# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Abt. ERN-3.
SOLAR PROCESS HEAT: TECHNOLOGY PROGRAM Final Report, Sep. 1983
Michael Kraft Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 152 p refs In GERMAN; ENGLISH

summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-234; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

Component and subsystem development of solar farm plants for industrial process heat is discussed. The control systems of solar farm plants were improved. The long term behavior of the main components of such plants was tested. Author (ESA)

N85-21813# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
PHASE CHANGE THERMAL ENERGY STORAGE AND THE MODEL BUILDING CODES Final Report
Joseph Greenberg and Belinda C. Reeder Aug. 1984 294 p refs
(Contract DE-AI01-76PR-06010)
(PB85-111201; NBSIR-84-2909) Avail: NTIS HC A13/MF A01 CSCL 10B

Thermal energy systems using phase change materials are currently being developed and used for storing energy collected by solar and other means. The initial pages of this report describe the more commonly accepted phase change materials and systems, present a taxonomy which is applicable to building construction, and describe the interface between the various model codes and the more advanced phase changes system configurations. The report continues with an analysis of the model codes with a specific orientation to phase change thermal energy storage systems. The analysis is structured according to building, mechanical, and plumbing issues with topics relevant to phase change systems identified and specific code provision applicable to each topic listed. Author (GRA)

N85-21814# Botswana Technology Centre, Gaborone.
POWER FROM THE SUN: LIGHT AT NIGHT
A. T. Aarsse Jun. 1984 25 p
(PB85-124097; TP-2) Avail: NTIS HC A02/MF A01 CSCL 10A

The basics of photovoltaic technology are explained. The application described in the paper is the lighting of a house during the night from energy generated and collected during the day. The aspects covered in a general fashion are the energy produced by a typical panel, the energy used in the house, different components and their placement, the wiring of the system and maintenance requirements. Sample calculations and costs are also included. The solar panel used in the energy calculations is the ARCO M-61 panel. Author (GRA)

N85-21815# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
MULTIYEAR PLAN FOR EXPERIMENTAL SYSTEMS RESEARCH PASSIVE AND HYBRID SOLAR ENERGY PROGRAM
Joseph Greenberg Nov. 1984 53 p
(Contract DE-AI01-76PR-06010)
(PB85-146868; NBSIR-84-2972) Avail: NTIS HC A04/MF A01 CSCL 10A

This report addresses the development of a multi-year plan for Experimental Systems Research focused at gaining the necessary knowledge to advance the understanding of passive and hybrid solar energy technology. This understanding includes the ability to acquire building performance data under controlled conditions so that the fundamental mechanism of the driving forces that effect change, along with the resulting change, can be studied. This report articulates the results of this effort and details the recommended Experimental Systems Research Activities for solar passive and hybrid technologies for FY85 and beyond. GRA

N85-21816# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
EVALUATION OF ETTRINGITE AND RELATED COMPOUNDS FOR USE IN SOLAR ENERGY STORAGE Progress Report
Leslie J. Struble and Paul W. Brown Oct. 1984 46 p refs Sponsored by DOE
(PB85-146876; NBSIR-84-2942) Avail: NTIS HC A03/MF A01 CSCL 10C

This report describes an investigation of ettringite and related phases for potential application in solar energy storage. The specific objective is to evaluate the potential of ettringite dehydration and rehydration as a phase change for energy storage. Synthesis procedures have been developed, and a number of ettringite-type phases have been prepared. The heat capacity of each phase was approximately 0.3 calories per gram per degree Celsius. Studies of the dehydration of these phases at atmospheric pressure indicate that the material has good potential as a phase change material for solar energy storage. Dehydration occurred at temperatures in the range between approximately 30C and 55C, with changes in enthalpy ranging between 100 and 240 calories per gram sample. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-21817# Oak Ridge National Lab., Tenn.
RESPONSE OF UNMANAGED FORESTS TO CO2-INDUCED CLIMATE CHANGE: AVAILABLE INFORMATION, INITIAL TESTS AND DATA REQUIREMENTS
Allen M. Solomon, M. Lynn Tharp, Darrell C. West, George E. Taylor, J. Warren Webb, and Judith L. Trimble Apr. 1984 104 p refs
(Contract W-7405-eng-26)
(DOE/NSB-0053; TR009) Avail: NTIS HC A06/MF A01

The scientific literature is reviewed to determine how tree recruitment, growth, and mortality are related to climate directly and indirectly through climate's modulation of plant competition, succession, and migration. The resulting potential responses of forest communities to climate changes expected under increased atmospheric CO2 concentrations are described. Empirical data sets, containing measurements of climate variables and tree densities in the eastern United States, are evaluated for their potential use in statistical projections of forest responses to climate change. Also evaluated for projection purposes is a forest-stand simulation model based on many of the processes which determine forest dynamics. A model experiment simulated responses of forests at those 21 locations to a scenario in which climate responds to doubling and quadrupling of CO2. The implications of the forest simulations are discussed in terms of internal forest dynamics and requirements for specified information from climate projections, as well as for additional model developments that could address remaining ecological uncertainties. Author

N85-21818# Committee on Interior and Insular Affairs (U. S. House).
EFFECTS OF AIR POLLUTION AND ACID RAIN ON FOREST DECLINE
Washington GPO 1984 233 p refs Oversight hearing before the Subcomm. on Mining, Forest Management and Bonneville Power Administration of the Comm. on Interior and Insular Affairs, 98th Congr., 2d Sess., 7 Jun. 1984
(GPO-37-459) Avail: Subcommittee on Mining, Forest Management and Bonneville Power Administration

Acid deposition and its affects upon the forests of the United States are discussed. The role of sulfur dioxide was discussed in its relationship to distress symptoms of the eastern white pine. The roles in atmospheric loading of SOZ, NOX, photo-oxidants, and other heavy metals were also discussed. Also included is the evidence and effects of atmospheric pollution in German forests. B.G.

N85-21819# National Science Foundation, Washington, D.C.
APPLICABILITY OF LABORATORY KINETICS STUDIES TO THE EVALUATION OF AQUEOUS PHASE ATMOSPHERIC OXIDATION OF SULFUR-4
G. Tesi and S. E. Schwartz 1984 6 p Presented at Workshop

on Heterogeneous Atmospheric Chem. Vienna, 7 May 1984 Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-000586; BNL-35208; CONF-8405248-1) Avail: NTIS HC A02/MF A01

An overall problem facing atmospheric chemistry concerns the mechanism whereby gaseous precursors are oxidized and incorporated into atmospheric liquid water. There are two classes of pathways: gas phase oxidation, soluble product and solution in water; and gas phase species, solution in water and oxidation. The mechanisms and reaction rates of these processes in the atmosphere are investigated. This research focuses on processes involving aqueous phase chemical reactions. Reaction rates of these processes in the atmosphere are evaluated on the basis of measured and modeled reagent concentrations. DOE

N85-21820# Interagency Task Force on Acid Precipitation, Washington, D.C.
REPORT ON THE SECOND ANNUAL REVIEW MEETING OF THE NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM. RESEARCH TO ASSIST DECISIONMAKING: SUMMARY
1984 80 p Presented at 2nd Ann. Rev. Meeting of the Natl. Acid Precipitation Assessment Program, Frederick, Md., 31 Jan. 1984
(DE85-003003; CONF-840180-Summ) Avail: NTIS HC A05/MF A01

The discussions and major recommendations of the second annual meeting of the National Acid Precipitation Assessment Program (NAPAP) are summarized. The theme for the meeting was research to assist decisionmaking. The purpose was to enhance the dialogue between decisionmakers and the scientific community regarding the information needed by decisionmakers and the information research can provide. Discussion focused on the significance of current data and gaps, priorities for research and improving the communication of results. DOE

N85-21821# Oak Ridge National Lab., Tenn.
COMBINED EFFECTS OF ATMOSPHERIC DEPOSITION, INTERNAL ACID PRODUCTION, AND HARVESTING ON NUTRIENT GAINS AND LOSSES FROM FOREST ECOSYSTEMS
D. W. Johnson and D. D. Richter 1984 9 p refs Presented at TAPPI Res. and Develop. Conf., Appleton, Wis., 30 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-002325; CONF-8409153-3) Avail: NTIS HC A02/MF A01

Atmospheric deposition can cause nutrient gains (N, S) or losses (Ca, Mg, K) from forest ecosystems, whereas harvesting causes only losses. It is indicated that S deposition in polluted regions greatly exceeds S export via whole-tree harvesting, but this is not normally the case for N. Both atmospheric acid deposition and harvesting can cause the loss of base cations, but because of tree selectivity in cation uptake, it appears that harvesting has a greater impact on the export of scarce or limiting cations than will acid deposition or internal acid generation. However, nutrient losses via harvesting can be minimized by timing harvests and losses can be compensated for by prop fertilization under intensive management regimes. DOE

N85-21822# Brookhaven National Lab., Upton, N. Y.
GAS-LIQUID CHEMISTRY OF NATURAL WATERS, VOLUME 1
L. Newman, ed. Apr. 1984 240 p refs Presented at Gas-Liquid Chem. of Nat. Waters Conf., Upton, N.Y., 1 Apr. 1984
(Contract DE-AC02-76CH-00016)
(DE85-002603; BNL-51757-Vol-1; CONF-840489-Vol-1-Summ) Avail: NTIS HC A11/MF A01

Mechanisms of oxidation in water were discussed which included the chemistry of marine, freshwater on atmospheric systems. Abstracts on the topics are presented. DOE

N85-21823# Brookhaven National Lab., Upton, N. Y.
GAS-LIQUID CHEMISTRY OF NATURAL WATERS, VOLUME 2
L. Newman, ed. Apr. 1984 177 p refs Presented at Gas-Liquid Chem. of Nat. Waters Conf., Upton, N.Y., 1 Apr. 1984
(Contract DE-AC02-76CH-00016)
(DE85-002457; BNL-51757-Vol-2; CONF-840489-Vol-2-Summ) Avail: NTIS HC A09/MF A01

Topics covered include marine chemistry, atmospheric chemistry, atmospheric chemistry, transport properties, clouds, atmospheric composition, photochemical reactions, peroxides, photolysis, and precipitation chemistry. B.G.

N85-21824# Battelle Pacific Northwest Labs., Richland, Wash.
ELECT GROUNDWATER TRANSPORT RESEARCH CODE Final Report
Nov. 1984 73 p refs
(Contract DE-AC06-76RL-01830)
(DE85-003284; EPRI-CS-3738) Avail: NTIS HC A04/MF A01

A computer code for the solution of a wide range of contaminant transport problems was developed. Based on Neuman's adaptive method, it combines the desirable features of both the method of characteristics and the finite element method. This should make the code applicable to a wide range of problems if the adaptive process can be appropriately controlled. In its present state the code should be considered a partially completed research code. Time and funding limitations prevented finding those parameter values and procedures necessary to adequately control the adaptive solution method. The analytical solution and program input data sets for the one and two dimensional transport problems being used to determine the needed controls are included. Two sample problems provide a means for continuing the study of the adaptive parameters for the code. DOE

N85-21825# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
MODELING INTERCEPTION OF RAINFALL BY FORESTS AND THE ROLE OF INTERCEPTION IN THE WATER BALANCE
C. E. Murphy, Jr. 1984 37 p refs Presented at Long-Term Ecol. Processes in Forested Waterbeds Conf., Athens, Ga., 15 Oct. 1984
(Contract DE-AC09-76SR-00001)
(DE85-002822; DP-MS-84-113; CONF-8410181-1) Avail: NTIS HC A03/MF A01

Interception is an important component of the forest water balance that cannot be ignored where accurate water balance estimates are desired. The state of modelling the interception of rainfall has been greatly improved by the development of models using a dynamic canopy water balance. These models show promise of allowing prediction of interception for forests where detailed interception studies have not been done. There is certainly coupling of the forest water balance and the larger scale meteorological processes. However, it does not appear that evaporation of intercepted water takes place in a closed system and advection of dry air is available to keep evaporation rates relatively high under many conditions. This means that interception loss will change significantly with manipulation of forest cover and will affect the water balance. In climates where evaporation of interception is low, it is likely that much of the intercepted water evaporates after the rainfall period. In a post rainfall environment, it is possible for evaporation to be greater than transpiration even if sensible heat is not available as a source of energy. DOE

N85-21826# Pacific Northwest Lab., Richland, Wash.
OSCAR EXPERIMENT HIGH-DENSITY NETWORK DATA REPORT Storm Event Report, 16-17 Apr. 1981
M. Terry Dana, R. C. Easter, and J. M. Thorp Dec. 1984 192 p refs
(Contract DE-AC06-76RL-01830)
(DE85-004907; PNL-5152-Pt-32SER-3) Avail: NTIS HC A09/MF A01

The oxidation and scavenging characteristics of April rains (OSCAR) experiment investigated the wet removal in cyclonic storm systems. The high-density component of OSCAR was located in northeast Indiana and included sequential precipitation chemistry measurements on a 100 by 100 km network, and airborne air chemistry and cloud chemistry measurements, surface air chemistry

measurements, and supporting meteorological measurements. Four separate storm events were studied. Data taken during the third storm event, April 16 to 17 are summarized which include the high density network precipitation chemistry data, air chemistry and cloud chemistry data, and meteorological data for the event, including standard products and radar and rawindsonde data from the network. DOE

N85-21827# California Univ., Los Angeles. Lab. of Biomedical and Environmental Sciences.
ECOLOGICAL OBSERVATIONS AT THE SITE OF THE 10 MWe SOLAR THERMAL POWER SYSTEM (1978-1984)
R. G. Lindberg, ed. and F. B. Turner, ed. Sep. 1984 106 p refs (Contract DE-AC04-76DR-00789)
(DE85-004572; UCLA-12/1463) Avail: NTIS HC A06/MF A01

The ecological consequences of constructing, testing, and operating Solar One were assessed. Parallel studies included wildlife interactions and air quality monitoring. The following questions were studied: (1) the direct and indirect effects of construction on the surrounding ecosystem; (2) whether the facility represents an attractive nuisance or hazard to the indigeneous wildlife; (3) usefulness of revegetation of the graded heliostat field to control erosion or replace lost habitat; (2) whether the environmental observations made at Solar One can be extrapolated to larger future central receiver systems. E.A.K.

N85-21828# Bayer A.G., Dormagen (West Germany). Sparte Polyurethane Forschung.
HYDROLYSIS OF PLASTIC WASTES WITH THE AIM OF RECOVERING AND REPROCESSING THE STARTING COMPONENTS (RECYCLING) Final Report, April 1983
Georg Niederdellmann and Harald Petersen Bonn Bundesministerium fuer Forschung und Technologie Nov. 1984 37 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-250; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

Two tons of a uniform mixture of regenerated polyethers were prepared from unseparated flexible foam wastes, representing an average commercial foam production. In order to confirm laboratory results under production conditions, the regenerated polyether mixture was processed to secondary slab foam on a continuous production line. Foam manufacturing tests on a slab line with blends of 50% regenerated 50% virgin polyether give a stable open-cell slab stock foam with regular cell structure by only insignificant modification of foam formulation. Secondary foam is manufactured in different densities without any difficulty. Except for a slightly elevated compression set, the properties of secondary foams are all within the specification range of a standard flexible foam. Author (ESA)

N85-21829# Environmental Research Lab., Duluth, Minn.
RATIONALE AND BASIC DESIGN FOR EXPERIMENTAL ACIDIFICATION OF A LAKE ECOSYSTEM IN NORTHERN WISCONSIN
John G. Eaton Oct. 1984 11 p refs
(PB85-116077; EPA-600/D-84-254) Avail: NTIS HC A02/MF A01 CSCL 08H

A multidisciplinary, integrated study of acidification of a 45-acre lake (Little Rock Lake) in Vilas Co., Wisconsin was begun on August 1, 1983. Two nearly-equal basins of the lake will be separated by a removable plastic barrier and one basin acidified while the other serves as a simultaneous reference or control. The basic experimental design consists of a two-year preacidification (baseline condition) study period, a 4-year incremental acidification phase, and a one or more year recovery phase. GRA

N85-21830# Environmental Research Lab., Duluth, Minn.
ROLE OF BIOLOGICAL ASSESSMENT IN EFFLUENT CONTROL
D. I. Mount Oct. 1984 19 p
(PB85-116101; EPA-600/D-84-252) Avail: NTIS HC A02/MF A01 CSCL 08H

The U.S. Environmental Protection Agency issued a water-quality based policy in March 1984 which includes control of toxicity in effluents if receiving water impact occurs. Toxicity tests can be used to measure toxicity, estimate additional removal necessary to avoid impact, establish permit limits and for complicance monitoring. Toxicity tests are a direct measure of the effect for which control is sought and often are cheaper than chemical analyses. GRA

N85-21831# Environmental Research Lab., Narragansett, R.I.
STOCHASTIC CONVECTIVE-DISPERSIVE TRANSPORT MODEL FOR WASTES DISPOSED AT THE 106-MILE OCEAN DISPOSAL SITE
H. A. Walker, J. F. Paul, and V. J. Bierman, Jr. Oct. 1984 43 p refs
(PB85-116176; EPA-600/D-84-257) Avail: NTIS HC A03/MF A01 CSCL 13B

A two-dimensional, stochastic, convective-dispersive transport model was developed to predict expected dilutions for wastes disposed at the 106-Mile Ocean Disposal Site. The major model assumptions were: (1) wastes were completely mixed vertically and remained in the upper mixed layer, (2) the expected center of mass of a discrete dump of material was transported from the disposal site with the mean horizontal current, (3) expected dispersion of a discrete dump of material about its center of mass was determined by the variance and correlation structure of current velocities. Author (GRA)

N85-21832# Research Triangle Inst., Research Triangle Park, N.C.
STABILITY OF ORGANIC AUDIT MATERIALS AND RESULTS OF SOURCE TEST ANALYSIS AUDITS Status Report
R. K. M. Jayanty, W. F. Gutknecht, and C. E. Decker Oct. 1984 84 p refs
(Contract EPA-68-02-3767)
(PB85-116184; EPA-600/4-84-079; SR-6) Avail: NTIS HC A05/MF A01 CSCL 13B

A repository of 44 gaseous compounds including hydrocarbons, halocarbon, and sulfur species were established under contract with the U.S. Environmental Protection Agency (USEPA). The main objectives of this on going project are: (1) to provide gas mixtures to EPA, state/local agencies, or their contractors, as performance audits to assess the accuracy of source emission measurements in certain organic chemical manufacturing industries, (2) to corroborate the vendor's certified analysis of the gas mixtures by in house analysis, (3) to determine the stability of the gas mixtures with time by in house analysis, and (4) to explore the feasibility of new audit materials as requested by EPA. Thus far, 29 compounds were used to conduct 130 different audits. The results of these audits and a description of the experimental procedures used for analyses and available stability data are presented. GRA

N85-21833# Battelle Pacific Northwest Labs., Richland, Wash.
METHODS/MATERIALS MATRIX OF ULTIMATE DISPOSAL TECHNIQUES FOR SPILLED HAZARDOUS MATERIALS Final Report, 15 Feb. 1977 - 7 Jul. 1980
B. W. Mercer, G. W. Dawson, J. A. McNeese, and E. G. Baker Oct. 1984 130 p refs
(Contract EPA-68-03-2494)
(PB85-116853; EPA-600/2-84-170) Avail: NTIS HC A07/MF A01 CSCL 13B

Conventional methods for the ultimate disposal of spilled or released hazardous substances were evaluated. Disposal methods studied include incineration, pyrolysis, landfilling, fixation, biological treatment, and chemical treatment. Applications of and problems associated with each of these disposal methods are discussed. Special emphasis is given to spills of highly toxic and persistent hazardous materials. An annotated matrix was prepared to provide a full assessment of conventional disposal options for each class of hazardous material and for mixtures thereof. The hazardous materials are grouped according to physical/chemical

properties and placed in juxtaposition with the form (liquid, sludge) or composition of the spill residue containing the hazardous material (e.g., mixtures with water, grass, sand, debris, etc.). The disposal options are priority ranked for each given set of conditions. The annotation describes each disposal option and evaluates the influence of spill situation parameters on the disposal method with regard to effectiveness, cost, safety, availability of equipment and materials, and short and long term hazards. GRA

N85-21834# Multidisciplinary Energy and Environmental Systems and Applications, Torrance, Calif.

ASSESSMENT OF HAZARDOUS WASTE SURFACE IMPOUNDMENT TECHNOLOGY CASE STUDIES AND PERSPECTIVES OF EXPERTS Final Report, Sep. 1983 - May 1984

Masood Ghassemi, Michael Haro, and Linda Fargo Nov. 1984 314 p

(Contract EPA-68-02-3174)

(PB85-117059; EPA-600/2-84-173) Avail: NTIS HC A14/MF A01 CSCL 13B

Hazardous waste surface impoundments (SI) were studied. Actual and projected performances were compared. This collection analysis and dissemination of the accumulated experience can contribute significantly to improving SI design, construction and operation. Nine facilities were reviewed and assessed. They represent a range of industries, waste types and volumes, ages, environmental settings, liner types and designs, and systems for leak detection and ground water monitoring. GRA

N85-21835# TRC Environmental Consultants, Inc., East Hartford, Conn.

EVALUATION OF COMPLEX TERRAIN AIR QUALITY SIMULATION MODELS

D. Wackter and R. Londergan Jun. 1984 256 p refs

(Contract EPA-68-02-3514)

(PB85-119485; EPA-450/4-84-017) Avail: NTIS HC A12/MF A01 CSCL 13B

The results of a comprehensive evaluation of eight air quality models applicable to complex terrain are summarized. Seven of the models are Gaussian and one is numerical. The models are evaluated with data obtained from field measurements programs. The Cinder Cone Butte data base is for tracers released upwind of a dense sampler network for a limited number of hours. The Westvaco data base contains a year of routine hourly SO2 measurements for an 11 station network. Numerous tabulations of each model's performance in terms of statistical measures of performance recommended by the American Meteorological Society are included. The purpose is two-fold. First, it serves to document for the models considered, and similar models, their relative performance. Second, it provides the basis for a peer scientific review of the models. GRA

N85-21836# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.

AIR QUALITY CRITERIA FOR OZONE AND OTHER PHOTOCHEMICAL OXIDANTS. EXTERNAL REVIEW DRAFT, VOLUME 2

M. W. Holdren (Battelle Columbus Labs., Ohio), T. B. McMullen, B. E. Tilton, and H. Westberg (Washington State Univ.) Jul. 1984 468 p refs

(PB85-126043; EPA-600/8-84-020A-2-Vol-2) Avail: NTIS HC A20/MF A01; also available in set of 5 reports HC E99 as PB85-126027 CSCL 13B

Scientific information is presented relative to the health and welfare effects associated with exposure to ozone and other photochemical oxidants. Data on health and welfare effects are emphasized, but additional information is provided for understanding the nature of the oxidant pollution problem and for evaluating the reliability of effects data and their relevance to potential exposures to ozone and other photochemical oxidants at concentrations occurring in ambient air. Exposure-related topics pertaining to ozone and other photochemical oxidants are presented: (1) properties, chemistry, and measurement; (2) concentration typically found in ambient air; (3) formation and transport once formed; and (4) nature, source, measurement, and concentrations of precursors. The specific areas addressed on health and welfare effects are: the toxicological appraisal of effects of ozone and other oxidants, effects observed in controlled, human exposures, effects observed in field and epidemiological studies, effects on vegetation seen in field and controlled exposures, effects on natural and agroecosystems; and effects on nonbiological materials observed in field and chamber studies. GRA

N85-21837# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.

AIR QUALITY CRITERIA FOR OZONE AND OTHER PHOTOCHEMICAL OXIDANTS, EXTERNAL REVIEW DRAFT, VOLUME 3

R. M. Adams (Oregon State Univ., Corvallis), J. H. B. Garner, L. W. Kress (Argonne Lab., Ill.), J. A. Laurence (Cornell Univ., Ithaca, N.Y.), R. Oshima (California State Dept. of Food and Agriculture), Eva Pell (Pennsylvania State Univ., University Park), Richard Reinert (North Carolina State Univ., Raleigh), O. C. Taylor (California Univ., Riverside), and David T. Tingey (Environmental Research Lab., Corvallis, Oreg.) Jul. 1984 406 p refs

(PB85-126050; EPA-600/8-84-020A-3-Vol-3) Avail: NTIS HC A18/MF A01; also available in set of 5 reports HC E99 as PB85-126027 CSCL 13B

The effects of photochemical oxidants on vegetation and the responses of vegetation to photochemical oxidants are reviewed. The general methodologies used in studies of air pollution effects to provide a basis for understanding the methods, approaches, and experimental designs used in the studies are discussed. Ozone and PAN are discussed and each follow the same general outline, which includes: (1) mode of action of the pollutant; (2) physical, biological, and chemical factors that alter plant response; and (3) primary emphasis on the effects of the individual pollutants on the response of plants to various concentrations and durations of exposure. GRA

N85-21838# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.

AIR QUALITY CRITERIA FOR OZONE AND OTHER PHOTOCHEMICAL OXIDANTS. EXTERNAL REVIEW DRAFT, VOLUME 4

D. E. Gardner (Northrop Services, Inc., Research Triangle Park, N. Car.), J. A. Graham, S. M. Loscutoff, D. B. Menzel (Duke Univ. Medical Center, Durham, N. Car.), D. L. Morgan (Duke Univ. Medical Center, Durham, N. Car.), J. H. Overton, Jr. (Northrop Services, Inc., Research Triangle Park, N. Car.), J. A. Raub, S. C. Strom (Duke Univ. Medical Center, Durham, N. Car.), and W. S. Tyler (California Univ., Davis) Jun. 1984 289 p refs

(PB85-126068; EPA-600/8-84-020A-4-Vol-4) Avail: NTIS HC A13/MF A01; also available in set of 5 reports HC E99 as PB85-126027 CSCL 13B

The effects of ozone on experimental animals are discussed. Carefully controlled studies of the effects of ozone on animals are particularly important in elucidating subtle effects not easily found in man through epidemiological studies and in identifying chronic toxicity not apparent from short term controlled human exposures. Animal studies allow investigations into the effects of ozone exposure over a lifetime, uncomplicated by the presence of other pollutants. In the animal experiments presented, a broad range of ozone concentrations were studied, and many of the effects of ozone are reasonably well described. GRA

N85-21839# National Oceanic and Atmospheric Administration, Rockville, Md. Air Resources Lab.

ATLANTIC COAST UNIQUE REGIONAL ATMOSPHERIC TRACER EXPERIMENT (ACURATE)

J. L. Heffter (Du Pont de Nemours (E. I.), Aiken, S. C.), J. F. Schubert (Du Pont de Nemours (E. I.), Aiken, S. C.), and G. Mead (BOC Group, Murray Hill, N. J.) Oct. 1984 66 p refs

(PB85-128460; NOAA-TM-ERL-ARL-130) Avail: NTIS HC A04/MF A01 CSCL 13B

The Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE) was conducted to provide a long-range,

long-term data set on the regional scale for air pollution model development and evaluation. ACURATE, which started in March 1982 and ended after 19 months in September 1983, used Kr-85 emitted intermittently from the Savannah River Plant (SRP), SC as a tracer of opportunity. Hourly source emission data are archived on an ACURATE data tape and listed. Surface air samples were taken at five sites along the Atlantic Coast, located about 300 to 1100 km from the SRP (twice-daily samples at the four closest sites and daily at the fifth site). A total of 3858 measured concentrations were quality assured and are archived on the data tape. About 750 of the concentrations were attributed directly to the SRP plume. GRA

N85-21840# National Marine Fisheries Service, Seattle, Wash.
STANDARD ANALYTICAL PROCEDURES OF THE NOAA NATIONAL ANALYTICAL FACILITY, 1984-85: EXTRACTABLE TOXIC ORGANIC COMPOUNDS
William D. MacLeod, Jr., Donald W. Brown, Andrew J. Friedman, Orlando Maynes, and Ronald W. Pearce Oct. 1984 102 p refs (PB85-126282; NOAA-TM-NMFS-F/NWC-64) Avail: NTIS HC A06/MF A01 CSCL 07D

Associations between organic chemical contamination of the aquatic environment and impacts on environmental health and, potentially on human health were demonstrated. To compare the results of one study with those of another, uniform analytical methods for the chemicals will be required. To meet this need a technical memorandum was prepared by NOAA as a methods manual for extractable organic chemicals in marine sediments and tissues. It applies specifically to the organic analytes selected for documentation by NOAA's national status and trends (S and T) program. GRA

N85-21841# Environmental Research Lab., Duluth, Minn.
SUMMARY REPORT OF THE WORKSHOP ON STRUCTURE ACTIVITY CONCEPTS IN ENVIRONMENTAL SCIENCES
Marion W. Meader, ed. Dec. 1984 308 p refs
(PB85-137339; EPA-600/D-84-284) Avail: NTIS HC A14/MF A01 CSCL 07D

The theoretical and practical considerations in the application of structure activity relationships (SAR) to chemical hazard assessment have been the subject of much research and debate. In order to focus this research on producing the most cost effective methods of chemical evaluation, EPA sponsored a workshop on SAR in Environmental Sciences in San Antonio, Texas. Experts from industry, academia and government were invited to examine the state of the art of current SAR methods, the limitations of SAR for EPAs mission, and develop research priorities for SAR over the next two years. GRA

N85-21842# Battelle Pacific Northwest Labs., Richland, Wash.
HAZARDOUS AIR POLLUTANTS: WET REMOVAL RATES AND MECHANISMS Final Report
M. T. Dana, R. N. Lee, and J. M. Hales Dec. 1984 106 p refs (PB85-138626; EPA-600/3-84-113) Avail: NTIS HC A06/MF A01 CSCL 07D

Fourteen hazardous organic air pollutants were evaluated for their potentials to be wet deposited by precipitation scavenging. This effort included a survey of solubilities (Henry's Law constants) in the literature, measurement of solubilities of three selected species, development and documentation of a general deposition model (MPADD) which includes dry deposition and plume depletion, and performance of scavenging field experiments to provide a data base for testing the model. Solubility parameters (dimensionless ratio of aqueous concentration to air concentration) for ethylene oxide, nitrobenzene, and methyl chloroform were measured in rainwater at two temperatures each Four field experiments were conducted: three using nitrobenzene and one involving methyl chloroform. Agreement of measured concentrations with model calculated values was good for nitrobenzene. Author (GRA)

N85-21843# Battelle Pacific Northwest Labs., Richland, Wash.
HAZARDOUS AIR POLLUTANTS: DRY-DEPOSITION PHENOMENA
G. A. Sehmel, R. N. Lee, and T. W. Horst Dec. 1984 80 p refs (PB85-138279; EPA-600/3-84-114) Avail: NTIS HC A05/MF A01 CSCL 13C

Dry-deposition rates were evaluated for two hazardous organic air pollutants, nitrobenzene and perchloroethylene, to determine their potential for removal from the atmosphere to three building material surfaces, cement, tar paper, and vinyl asbestos tile. Dry-deposition experiments were conducted in two stirred chambers. Building materials were placed on the bottom of the stirred chambers, and removal rates were evaluated by introducing the organic air pollutant along with nondepositing sulfur hexafluoride (SF6) tracer gas into a stirred chamber. Changes in airborne concentrations with time were then monitored. Because the HAP removal rates were small, sulfur hexafluoride tracer gas was used to evaluate the rates of leakage from the SC in order to correct the deposition rates. Author (GRA)

N85-21844# Systems Applications, Inc., San Rafael, Calif.
CONTINUED RESEARCH IN MESOSCALE AIR POLLUTION SIMULATION MODELING. VOLUME 6. FURTHER STUDIES IN THE MODELING OF MICROSCALE PHENOMENA Final Report, Oct. 1979 - Jul. 1982
R. G. Lamb, D. R. Durran, L. E. Reid, W. R. Shu (California Inst. of Technology), and J. H. Seinfeld (California Inst. of Technology) Dec. 1984 307 p refs 7 Vol.
(Contract EPA-68-02-2216)
(PB85-137370; EPA-600/3-84-095B) Avail: NTIS HC A14/MF A01 CSCL 13B

The development of techniques for modeling the microscale phenomena associated with urban air pollution is described. Such phenomena include turbulent diffusion, turbulent concentration fluctuations, and sub-grid scale variations in the time averaged concentration field. Optimal eddy diffusivities were reexamined to determine whether: (1) the diffusivities are unique, (2) they have a universal form when properly scaled, and (3) they are dependent on source height. A model for describing the effects of turbulent concentration fluctuations on second-order chemical reactions has also been developed and tested. A method of parameterizing the effects of chemical reaction rates of both subgrid-scale concentration variations arising from ground-level sources and turbulence-induced concentration fluctuations has also been developed. GRA

N85-21845# SRI International Corp., Menlo Park, Calif.
OBSERVATIONAL STUDY OF TRANSPORT IN THE FREE TROPOSPHERE
J. K. S. Ching, E. E. Uthe, B. M. Morley, and W. Viezee Jan. 1985 8 p refs
(Contract EPA-68-02-3791)
(PB85-144145; EPA-600/D-84-300) Avail: NTIS HC A02/MF A01 CSCL 13B

Processes in the free troposphere are not adequately documented or understood and are generally ignored in current trajectory calculation schemes and source to receptor models. A technique to track free tropospheric pollutant transport was recently developed. The feasibility of using airborne lidar to observe the three dimensional distribution of fluorescent dye particle tracers in long range atmospheric transport and dispersion studies as a candidate approach successfully demonstrated in field experiments conducted in the North East U.S. during October 1983. This approach uses a lidar system to excite nontoxic fluorescent dye particle released into the atmosphere, and to monitor emitted fluorescent light. Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-21846* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR CALIBRATING THE IONOSPHERE AND APPLICATION TO SURVEILLANCE OF GEOPHYSICAL EVENTS Patent

Peter F. MacDoran, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 31 Jul. 1984 9 p Filed 17 Nov. 1981 Supersedes N82-26890 (20 - 17, p 2441)
(NASA-Case-NPO-15430-1; NAS 1.71:NPO-15430-1; US-Patent-4,463,357; US-Patent-Appl-SN-322317; US-Patent-Class-343-460; US-Patent-Class-343-352; US-Patent-Class-343-5W) Avail: US Patent and Trademark Office CSCL 04A

The columnar electron content of the ionosphere between a spacecraft and a receiver is measured in realtime by cross correlating two coherently modulated signals transmitted at different frequencies (L1,L2) from the spacecraft to the receiver using a cross correlator. The time difference of arrival of the modulated signals is proportional to electron content of the ionosphere. A variable delay is adjusted relative to a fixed delay in the respective channels (L1,L2) to produce a maximum at the cross correlator output. The difference in delay required to produce this maximum is a measure of the columnar electron content of the ionosphere. A plurality of monitoring stations and spacecraft (Global Positioning System satellites) are employed to locate any terrestrial event that produces an ionospheric disturbance.

Official Gazette of the U.S. Patent and Trademark Office

N85-21847*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

MEASUREMENTS OF THE SURFACE ENERGY BUDGET IN THE SOUTHERN GOBI DESERT OF CHINA, AND IN THE ROCKY MOUNTAINS OF COLORADO Progress Report, 15 Feb. 1984 - 28 Feb. 1985

Elmar R. Reiter, Eric A. Smith, and John D. Sheaffer 28 Feb. 1985 99 p refs
(Grant NAGw-601)
(NASA-CR-175506; NAS 1.26:175506) Avail: NTIS HC A05/MF A01 CSCL 04A

Observations of the land surface energy balance were made in the Gobi desert and at two mountain sites in northern Colorado. The Gobi study included 12 days of observations in spring (April 8 to 20, 1984) and 31 days in summer at the same site (June 17 to July 18, 1984). The Colorado study included 126 days (March 13 to July 17, 1984) at a valley site and 34 days (July 31 to September 3, 1984) at a mountain top location. The data for each study included continuous observations of upward and downward radiative fluxes in three wave bands, soil temperature and moisture at four levels, air temperature and humidity at four levels and UVW wind components at three levels. Analyses of the Gobi data include definition of the impact of variable atmospheric moisture on the surface energy balance between spring and summer. In addition, diurnal wind circulations forced by heating of the northern edge of the Tibetan Plateau were observed during both periods.

R.J.F.

N85-21848# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.

MESH EFFECTS ON THE COMPUTATION OF NON-LINEAR GRAVITY WAVES OF ARBITRARY DISCHARGE

E. F. Toro Mar. 1985 37 p refs
(Coll-Aeron-8501; ISBN-0-947767-118) Avail: NTIS HC A03/MF A01

Numerical computations of non-linear gravity waves are presented and the effects of mesh variations on the results are discussed. Waves are regarded as two-parameter families (gamma, alpha) sub Q of arbitrary discharge Q, and computations are carried out using a new Kantorovich algorithm. Mesh effects are to a large extent, dependent on the particular wave region under consideration. Three such regions are identified and typical exmaples are computed and discussed. Author

N85-21849*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CHEMICAL KINETICS AND PHOTOCHEMICAL DATA FOR USE IN STRATOSPHERIC MODELING. EVALUATION NUMBER 6

W. B. Demore, M. J. Molina, R. T. Watson, D. M. Golden (SRI International), R. F. Hampson (NBS), M. J. Kurylo (NBS), C. J. Howard (Environmental Research Lab.), and A. R. Ravishankara (Georgia Inst. of Technol.) 15 Sep. 1983 219 p refs
(NASA-CR-175564; JPL-Pub-83-62; NAS 1.26:175564) Avail: NTIS HC A10/MF A01 CSCL 04A

Evaluated sets of rate constants and photochemical cross sections are presented. The primary application of the data is in the modeling of stratospheric processes, with particular emphasis on the ozone layer and its possible perturbation by anthropogenic and natural phenomena. A.R.H.

N85-21850*# Illinois Univ., Urbana. Aeronomy Lab.

ROCKET OBSERVATIONS OF THE IONOSPHERE DURING THE ECLIPSE OF 26 FEBRUARY 1979

M. K. McInerney and L. G. Smith 1 Jun. 1984 364 p refs
(Grant NGR-14-005-181)
(NASA-CR-175513; NAS 1.26:175513; AR-113; ISSN-0568-0581; UILU-ENG-84-2501) Avail: NTIS HC A16/MF A01 CSCL 04A

Electron density profiles and energetic particle fluxes were determined from two rockets launched, respectively, at the beginning and end of totality during the solar eclipse of 26 February 1979. These, and one other rocket at the same time of day on 24 February 1979, were launched from near Red Lake, Ontario. The electron density profile from 24 February shows the electron density to be normal above 110 km, to rocket apogee. Below 110 km, the electron density is enhanced, by an order of magnitude in the D region, compared with data from Wallops Island at the same solar zenith angle (63 deg). The enhancement is qualitatively explained by the large flux of field aligned energetic particles observed on the same rocket. During totality (on 26 February) the electron density above 110 km to rocket apogee is reduced by a factor of about three. Below 110 km, the electron density is much greater than observed during previous eclipses. The particle flux measured on the 26 February was an order of magnitude less than that on the 24 February but showed greater variability, particularly at the higher energies (100 keV). A feature of the particle flux is that, for the two rockets that were separated horizontally by 38 km while above the absorbing region, the variations are uncorrelated. A.R.H.

N85-21851*# Illinois Univ., Urbana. Aeronomy Lab.

AN IMPROVED ROCKET-BORNE ELECTRIC FIELD METER FOR THE MIDDLE ATMOSPHERE

D. L. Burton and L. G. Smith 1 Jul. 1984 115 p refs
(Grant NGR14-005-181)
(NASA-CR-175510; NAS 1.26:175510; AR-114; UILU-ENG-84-2502) Avail: NTIS HC A06/MF A01 CSCL 04A

Improvements in a rocketborne electric field meter designed to measure the atmosphere's electric field and conductivity in the middle atmosphere are described. The general background of the experiment is given as well as changes in the instrument and data processing schemes. Calibration and testing procedures are documented together with suggestions for future work. A.R.H.

N85-21852# Finnish Meteorological Inst., Helsinki.

DISTRIBUTION OF ATMOSPHERIC ELECTRIC CURRENT IN THE GLOBAL CIRCUIT

Tapio J. Tuomi Jul. 1984 69 p refs
(Contrib-87; ISSN-0071-5190; ISBN-951-697-211-X) Avail: NTIS HC A04/MF A01

The atmospheric electric global circuit is studied in terms of a model which includes the spherical Earth geometry and an atmospheric electrical conductivity profile consisting of sections that grow exponentially with height. The ionosphere up to an altitude of 200 km is characterized by a conductivity anisotropy caused by the geomagnetic field. The source of the tropical model is a longitudinally symmetric annular charge parallel to the equator and not far from it, and the geomagnetic field is assumed to be

horizontal everywhere. In both cases the geometric structure of the circuit is determined by computing the flow lines of the current. In either model, practically no horizontal currents occur below the ionosphere, except for the immediate vicinity of the sources. A time-dependent analysis in the high-altitude case shows that low-frequency (up to 10 Hz) transients caused by lightning do not severely disturb the stationary flow geometry. B.G.

N85-21853# Teledyne Geotechnical, Garland, Tex.
SEISMIC OBSERVATION OF INFRASONIC SIGNALS Final Report, 15 Jul. 1983 - 14 Jul. 1984
J. G. Swanson and J. C. Woerpel 1 Nov. 1984 133 p
(Contract F49620-83-C-0136; DARPA Order 4346)
(AD-A149574; TR-84-7; AFOSR-84-1206TR) Avail: NTIS HC A07/MF A01 CSCL 08/11

A sliding pure-state filter attenuated wind-induced noise recorded by individual elements of a four-element microbarograph array an average of 22 dB. Summation of the processed microbarograms yielded an additional 5 dB attenuation, whereas summation of the unprocessed microbarograms attenuated the noise 6 dB relative to the individual microbarograms. A sliding pure-state filter yielding separate estimates of linearly and elliptically polarized arrivals, applied to the outputs of three-component, long-period inertial seismographs at a site near McKinney, Texas, and at Seismic Research Observatories ANMO, BOCO, and GRFO detected infrasonic signals from five eruptive sequences of E1 Chichon volcano. Application of the pure-state filter improved the signal-to-noise ratio of the seismically detected infrasonic signals an average of 14 dB. A combination of adaptive beam forming and pure-state filtering applied to the outputs of the seven elements of the NORSAR three-component, long-period array marginally detected an infrasonic signal from the largest E1 Chichon eruption. GRA

N85-21854# California Univ., Davis.
ANALYSIS AND COMPUTATIONS OF MICROWAVE-ATMOSPHERIC INTERACTIONS Final Report, 1 Sep. 1982 - 31 Aug. 1983
W. Woo and J. S. DeGroot 1 Jun. 1984 26 p
(Contract N00019-82-C-0448)
(AD-A149666; AD-E001740; PRG-R-98) Avail: NTIS HC A03/MF A01 CSCL 04/1

The Plasma Research Group has continued the theoretical investigation of microwave atmospheric interactions, in close coordination with personnel at the Naval Research Laboratory and elsewhere. The basic investigation concerns the propagation and absorption of microwaves above the breakdown threshold in the atmosphere with the self consistent breakdown plasma. Typical hydrodynamic calculations show that an ionization front is rapidly formed which moves toward the microwave source and consequently decouples the microwaves from the original ionization region. By focusing the microwaves or using a reflector, ionization can be confined to localized regions where the microwave strength is high enough to cause breakdown even though the incoming microwaves are below threshold. GRA

N85-21855# Lockheed Missiles and Space Co., Palo Alto, Calif.
S3-3 ONR-118 DATA ANALYSIS Final Report, 1 Jun. 1978 - 31 Oct. 1984
R. D. Sharp, E. G. Shelley, R. G. Johnson, H. L. Collin, and A. G. Ghielmetti 31 Oct. 1984 38 p Original contains color illustrations
(Contract N00014-78-C-0479)
(AD-A149725) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report describes results of the ONR-118 instrument flown on the S3-3 satellite launched in July 1976 into a near polar orbit with apogee of 8,000 km. The instrument measured ion composition in the energy range E/Q = 0.5-16. keV/e, and electron fluxes in four bands between .07-24. keV. Principal results in the period of this contract addressed the acceleration of ionospheric ions and their trapping in the magnetosphere; the observation of narrow electron beams; and the characterization and modeling of auroral acceleration region. Energetic ions were observed resulting from both quasistatic electric fields and mass dependent transverse acceleration. Properties of ion outflow were examined as a function of latitude, local time, altitude, magnetic activity, and solar cycle phase. Electron beams were observed closely clustered in latitude with upflowing ions, and with apparent source location at altitudes at or above 1 RE. In the case of counterstreaming electrons, observations implied a source in multiple flickering double layers. The distributions of different ion species have been used in studies of wave growth stability and wave particle interactions, the morphology and dynamics of auroral processes, and the transport processes involved in magnetosphere-ionosphere coupling. GRA

N85-21856# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
AN ANALYSIS OF SHORT-TO-MEDIUM-RANGE SEISMIC ATTENUATION TESTS USING A MULTILAYERED VISCOELASTIC SEISMIC PROPAGATION MODEL Final Report
B. L. Carnes and J. R. Lundien Nov. 1984 219 p
(Contracts MIPR-FY7653-83-00010; MIPR-W31RPD-33-V062; DA Proj. 4A7-62730-AT-42)
(AD-A149771; WES/TR/EL-84-9) Avail: NTIS HC A10/MF A01 CSCL 08/11

This study was conducted to provide a database from which to draw conclusive results on the efficiencies of seismic wave propagation in natural terrain and the resolution and fidelity of multiple frequency signals, and to supplement data for validation of theoretical models of seismic wave propagation. An extensive test program was conducted at White Sands Missile Range, New Mexico, using an electrohydraulic vibrator, an impulse loader, and a vehicle as sources of seismic waves over a 5-m to 1-km range and using explosive seismic sources over a 1- to 10-km range. The results are presented for discrete frequency vibration test (1-120 Hz), tone burst tests (1-120 Hz), random noise vibration tests, and background noise tests for vehicle, impulse, and explosive tests. Analysis of data has been performed to correlate frequency, amplitude, range, and other signal characteristics with model predictions for future tests. This study relates the dispersion and attenuation of seismic waves, frequency resolution, and wind and background noise to the refinement of the WES seismic propagation model. GRA

N85-21857# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF STOCHASTIC SURFACE HEAT FLUXES ON THE CLIMATOLOGY OF THE SEASONAL THERMOCLINE M.S. Thesis
D. C. Copley Jun. 1984 51 p
(AD-A149957) Avail: NTIS HC A04/MF A01 CSCL 08/3

In this thesis, the stochastic forcing theory of Frankignoul and Hasselmann, 1977 is modified to include a mixed layer model. This enables the examination of the interaction between stochastic heat flux or wind stress components and the annual period surface heat flux. The presence of the stochastic flux component causes the average sea surface temperature to be 0.75 C higher then it would be with only the annual period component. It also delays the time of maximum surface temperature and causes the average mixed layer depth to be ten meters shallower. A stochastic wind stress component applied to an annual heat flux cycle produces a smaller sea surface temperature variance, but results in a more rapidly deepening and deeper mixed layer than achieved with an annual cycle and constant wind stress. The stochastic forcing model shows that the climatology of the seasonal thermocline is dependent on nonlinear interactions between the annual cycle and stochastic forcing. GRA

N85-21858# Colorado School of Mines, Golden. Center or Wave Phenomena.
VELOCITY INVERSION USING A STRATIFIED REFERENCE
Jack K. Cohen and Frank G. Hagin 25 Jan. 1985 59 p
(Contract N00014-84-K-0049)
(AD-A150082; CWP-021) Avail: NTIS HC A04/MF A01 CSCL 08/11

The purpose of this work is to present an inversion algorithm

for backscattered stacked seismic data which will reconstruct the velocity profile in realistic Earth conditions. The basic approach follows that of the original Cohen and Bleistein paper in that high frequency asymptotics and perturbation methods are used. However, in the original paper the perturbation was relative to a constant reference speed, whereas the current work uses a reference speed which may vary with depth. This greatly enhances the validity of the perturbation assumption and hence the inversion results. On the other hand, the new algorithm enjoys the same economies and stability properties of the original algorithm, making it very competitive with current migration schemes. Four major assumptions are made: (1) the acoustic wave equation is an adequate model, (2) stacked data has amplitude information worth preserving fairly accurately, (3) the actual reflectivity coefficients can be adequately modeled as perturbations from a continuous reference velocity which depends only on the depth variable, and (4) the subsurface can be adequately modeled as a series of layers with jump discontinuities in the velocity (or impedance) at these layers. GRA

N85-21859# Pacifica-Sierra Research Corp., Los Angeles, Calif.
CALCULATION OF IONOSPHERIC PROFILES BY INVERTING VLF/LF REFLECTION DATA. 2. ANISOTROPIC PROPAGATION Final Technical Report, Apr. 1980 - Jan. 1984
Chris R. Warber and Edward C. Field, Jr. Griffiss AFB, N.Y. RADC Dec. 1984 51 p
(Contract F19628-81-C-0088; AF Proj. 2305)
(AD-A150105; RADC-TR-84-242) Avail: NTIS HC A04/MF A01 CSCL 04/1

This report describes a method for inverting VLF/LF reflection data to obtain ionospheric electron densities for conditions in which the geomagnetic field causes the propagation to be anisotropic. It extends an earlier inversion method that was useful only for conditions in which the propagation could be assumed isotropic. The anisotropic method is demonstrated by inverting computer-generated reflection and conversion coefficients for three model ionospheres: SPE-disturbed, ambient daytime, and ambient nighttime. Satisfactory results were obtained for all three cases. GRA

N85-21860# Alaska Univ., Fairbanks. Geophysical Inst.
HIGH TIME RESOLUTION THERMOSPHERIC TEMPERATURE AND WIND STUDIES IN THE ARCTIC Final Report, 1 Aug. 1980 - 30 Sep. 1984
G. G. Sivjee 30 Sep. 1984 109 p
(Grant AF-AFOSR-0240-80)
(AD-A150114; AFOSR-84-1255TR; Rept-4) Avail: NTIS HC A06/MF A01 CSCL 04/1

This research program was initiated to develop state-of-the art instrumentation to study the dynamics of the polar thermosphere with high time resolution. The technique involves the measurement of Doppler profiles as well as wavelength shifts in various optical emissions to study the upper and lower thermosphere. Initially, a low light level television system (image orthicon) was coupled to a 150 mm aperture Fabry-Perot index-of-refraction scanning system. Acquisition of aurorally associated fringes in fractions of a second were obtained, however, lack of electronic stability in these older T.V. systems precluded the routine analysis of the data. A subsequent attempt to use a solid state intensified CID, T.V. camera indicated promise, but the lack of sensitivity limited high time resolutions data to very bright events. Rather than continue this direction, emphasis was switched to obtaining high quality temperature and wind measurements in the index-of-refraction scanning mode simultaneously in the upper and lower thermosphere. This was coupled with the installation and operation of a new piezo-electric rapid scanning system to assist in the investigation of thermospheric neutral (6300 OI) and ion (7320 OII), and D-Region (OH) dynamics. The results of the analyses of much of these data have been reported in various scientific meetings and published in the scientific literature. Other studies are still in progress. The initial results show the presence of gradients and divergences in the winds in both the high and low thermosphere in response to magnetic activity. From 44 nights of data collected prior to spring 1983, The dynamical behavior has been investigated both on individual nights and as a statistical average. GRA

N85-21861# Los Alamos Scientific Lab., N. Mex.
SUBSTORMS IN THE EARTH'S ATMOSPHERE
D. N. Baker 6 Aug. 1984 4 p refs Presented at the Am. Inst. of Phys. Conf., Taos, N. Mex., 6-11 Aug. 1984
(Contract W-7405-eng-36)
(DE85-000654; LA-UR-84-3097; CONF-8408121-2) Avail: NTIS HC A02/MF A01

A widely, but not universally, accepted model of substorms is described. The energy budgets, time scales, and conversion efficiencies for substorms are presented. The primary forms of substorm energy dissipation are given along with the average levels of the dissipation. Aspects of particle acceleration and precipitation, Joule heating mechanisms, ring current formation, and plasmoid escape are illustrated based on in situ observations taken from the large available data base. Possible analogues of substorm like behavior in other astrophysical systems are described. DOE

N85-21862# Los Alamos Scientific Lab., N. Mex.
STRUCTURE AND FORCING OF TELECONNECTION PATTERNS OCCURRING IN GENERAL CIRCULATION MODEL SIMULATIONS
R. C. Malone, E. J. Pitcher, M. L. Blackmon, and J. E. Geisler 1984 3 p refs Presented at 3rd Conf. on Climate Variations, Los Angeles, Calif., 8 Jan. 1985 Prepared in cooperation with Miami Univ., Fla., National Center for Atmospheric Research, Boulder, Colo., Utah Univ., Salt Lake City
(Contract W-7405-eng-35)
(DE85-002434; LA-UR-84-3447; CONF-850132-1) Avail: NTIS HC A02/MF A01

Several characteristics of teleconnection pattern fluctuations occurring in general circulation model (GCM) simulations are examined. The model used is the NCAR Community Climate Model. DOE

N85-21863# Los Alamos Scientific Lab., N. Mex.
A 3-D TREATMENT OF CONVECTIVE FLOW IN THE EARTH'S MANTLE
J. R. Baumgardner May 1984 21 p refs Presented at the Transport and Propagation in Nonlinear Systems Meeting, Los Alamos, N. Mex., 21 May 1984
(Contract W-7405-eng-36)
(DE85-003734; LA-UR-84-3762; CONF-8405240-2) Avail: NTIS HC A02/MF A01

A three dimensional finite element method is used to investigate thermal convection in the earth's mantle. The equations of motion are solved implicitly by means of a fast multigrid technique. The computational mesh for the spherical problem is derived from the regular icosahedron. The calculation described use a mesh with 43,554 nodes and 81,920 elements and were run on a Cray X. The earth's mantle is modeled as a thick spherical shell with isothermal, free slip boundaries. The infinite Prandtl number problem is formulated in terms of pressure, density, absolute temperature, and velocity and assumes an isotropic Newtonian rheology. Solutions are obtained for Rayleigh numbers up to approximately 10(6) for a variety of modes of heating. Cases initialized with a temperature distribution with warmer temperatures beneath spreading ridges and cooler temperatures beneath present subduction zones yield whole mantle convection solutions with surface velocities that correlate well with currently observed plate velocities. DOE

N85-21864# California Univ., Livermore. Lawrence Livermore Lab.
EVALUATION OF SUBSURFACE FRACTURE GEOMETRY USING FLUID PRESSURE RESPONSE TO SOLID EARTH TIDAL STRAIN
J. M. Hanson Sep. 1984 140 p Prepared in cooperation with Terra Tek, Inc., Salt Lake City, Utah
(Contract W-7405-eng-48)

(DE85-003294; UCID-20156) Avail: NTIS HC A07/MF A01

The nature of solid earth tidal strain and surface load deformation due to the influence of gravitational forces and barometric pressure loading are discussed. The pore pressure response to these types of deformation is investigated in detail, including the cases of a confined aquifer intersected by a well and a discrete fracture intersected by a well. The integration of the tidal response method with conventional pump tests in order to independently calculate the hydraulic parameters of the fracture formation system is discussed. How advanced spectral analysis methods, coupled with correlation analysis can be used to extract the tidal response signals from the pressure record is shown. Uncertainties in the signals are estimated using various information theoretic methods in order to place a confidence level at which we can safely assume that the measured signal is indeed of tidal origin. A detailed case study of the method carried out at the Raft River Geothermal Reservoir in Idaho is presented. DOE

N85-21865*# National Academy of Sciences - National Research Council, Washington, D. C.

GLOBAL TROPOSPHERIC CHEMISTRY: A PLAN FOR ACTION

Oct. 1984 206 p refs Sponsored in part by NASA (Grant NSF ATM-80-24257)
(NASA-CR-175545; NAS 1.26:175545; PB85-125524; ISBN-0-309-03481-7; LC-84-61498) Avail: NTIS HC A10/MF A01 CSCL 04A

Prompted by an increasing awareness of the influence of human activity on the chemistry of the global troposphere, a panel was formed to (1) assess the requirement for a global study of the chemistry of the troposphere; (2) develop a scientific strategy for a comprehensive plan taking into account the existing and projected programs of the government; (3) assess the requirements of a global study in terms of theoretical knowledge, numerical modeling, instrumentation, observing platforms, ground-level observational techniques, and other related needs; and (4) outline the appropriate sequence and coordination required to achieve the most effective utilization of available resources. Part 1 presents a coordinated national blueprint for scientific investigations of biogeochemical cycles in the global troposphere. part 2 presents much of the background information of the present knowledge and gaps in the understanding of tropospheric chemical cycles and processes from which the proposed program was developed. GRA

N85-21866# Fraunhofer Inst. fuer Physikalische Messtechnik, Frieburg (West Germany).

EXPERIMENT FOR MEASURING ELECTRIC FIELDS WITHIN THE SOUNDING ROCKET PROJECT ENERGY BUDGET Final Report, Dec. 1983.

Helmut Wolf and Reinhard Grabowski Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 88 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie and DFVLR
(BMFT-FB-W-84-048; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

The energy balance in the polar mesophere and lower thermosphere was examined by rocket-borne experiments for measuring the electric field. It is shown that the ionospheric E-region is an area of strong spatial fluctuation level while other regions present an almost constant fluctuation level. Author (ESA)

N85-21867# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A Solar-Terrestrial Physics.

ATMOSPHERIC HANDBOOK: ATMOSPHERIC DATA TABLES AVAILABLE ON COMPUTER TAPE

V. E. Derr Jul. 1984 70 p
(PB85-108512; UAG-89) Avail: NTIS HC A04/MF A01 CSCL 04A

Atmospheric data tables stored on computer tape and available for public use are described in this catalog/manual. These data are largely taken from results published in scientic journals. Data areas cover attenuation coefficients for the atmosphere, atmospheric parameters for 1962 standard atmospheres, cloud drop size distributions, water and ice particles, solar spectral irradiance, sky spectral radiance and rayleigh coefficients. The following appendices are given: (1) Appendix A: List of files on atmospheric handbook computer tape, listed by file number (LISTFILEO, tape files 0 and 8); (2)Appendix B: Computer tape file descriptions (FILEXDESCRIP, 9); (3) Appendix C: Fortran code for program ATTENCOEF (and related subroutines); atmospheric absorption and scattering coefficients (APPENDIXC, 218); (4) Appendix D: Fortran code for program MICRO (and related subroutines): select ice and water refractive indices in the microwave region (APPENDIXD, 219); and (5); Appendix E: List of useful atmospheric constants and conversion (FACTS,220). Author (GRA)

N85-21868# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.

AN ATLAS OF POLAR CAP ENERGETIC PARTICLE OBSERVATIONS. VOLUME 2: NOAA-6, 8 JULY 1979 TO 10 MAY 1983

Herbert H. Sauer Sep. 1984 159 p
(PB85-109072; NOAA-DR-ERL-SEL-4) Avail: NTIS HC A08/MF A01 CSCL 04A

This series presents graphical displays of the polar cap (herein defined as geomagnetic latitudes greater than 70 degrees) averages of the proton and electron fluxes precipitating into the polar atmosphere, over the energy range of 30 keV to greater than 80 MeV for protons and greater than 300 keV for electrons. Volume 2 presents data from the NOAA-6 spacecraft from 8 July 1979 to 10 May 1983. Subsequent volumes using data from the NOAA-6, -7 and -8 satellites will extend the data presentations. GRA

N85-21869# National Geophysical Data Center, Boulder, Colo. World Data Center A for Solid Earth Geophysics.

CATALOG OF SUBMARINE VOLCANOES AND HYDROLOGICAL PHENOMENA ASSOCIATED WITH VOLCANIC EVENTS: 1500 BC TO 31 DEC. 1899

Peter Hedervari (Georgiana Observatory, Budapest) Sep. 1984 86 p refs
(PB85-117984; SE-36) Avail: NTIS HC A05/MF A01 CSCL 08G

The idea of a comprehensive catalog of hydrological phenomena associated with volcanoes originated in 1979. Hundreds of pieces of worldwide data, spanning 3500 years from antiquity to the present are included. This first volume contains a short description of the events from about 1500 B.C. to the end of 1899. The report is a catalog of submarine volcanic eruptions, new islands, tsunamis, seiches, and base surges. GRA

N85-21870# National Environmental Satellite Service, Washington, D. C. Data and Information Service.

ATLAS OF RELECTANCE PATTERNS FOR UNIFORM EARTH AND CLOUD SURFACES (NIMBUS-7ERB-61 DAYS)

V. R. Taylor and L. L. Stowe Jul. 1984 93 p refs
(PB85-116382; NOAA-TR-NESDIS-10) Avail: NTIS HC 05/MF A01 CSCL 04A

Scanning channel data of the Nimbus-7 ERB instrument have been combined with auxiliary information to describe the radiative characteristics of surfaces as observed through the atmosphere. This information has been recorded on the ERB 'Sub-Target Radiance Tapes' (STRT). A description of that data base and procedures for obtaining the data may be found in Stowe and Fromm (1983). Selected data from the STRTs have been sorted into eight uniform earth and cloud surface types. Diagrams illustrating the bi-directional reflectivity of these surfaces have been constructed. The observed dependence of albedo on solar zenith angle (SZA) is discussed and figures illustrating this dependence are given. An extensive list of references is also given. This report contains a complete set of reflectance diagrams (patterns) and tables listing the values that were used in their construction and interpretation. Author (GRA)

N85-22217*# North Georgia Coll., Dahlonega. Dept. of Physics.
MODELS OF THE UPPER ATMOSPHERE
T. Michael Davis *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 28 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-21871* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
21 LAYER TROPOSPHERE-STRATOSPHERE CLIMATE MODEL
D. Rind, R. Suozzo, A. Lacis, G. Russell, and J. Hansen Dec. 1984 78 p refs
(NASA-TM-86183; NAS 1.15:86183; GNC84-027) Avail: NTIS HC A05/MF A01 CSCL 04B

The global climate model is extended through the stratosphere by increasing the vertical resolution and raising the rigid model top to the 0.01 mb (75 km) level. The inclusion of a realistic stratosphere is necessary for the investigation of the climate effects of stratospheric perturbations, such as changes of ozone, aerosols or solar ultraviolet irradiance, as well as for studying the effect on the stratosphere of tropospheric climate changes. The observed temperature and wind patterns throughout the troposphere and stratosphere are simulated. In addition to the excess planetary wave amplitude in the upper stratosphere, other model deficiences include the Northern Hemisphere lower stratospheric temperatures being 5 to 10 C too cold in winter at high latitudes and the temperature at 50 to 60 km altitude near the equator are too cold. Methods of correcting these deficiencies are discussed. B.G.

N85-21872*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULTANEOUS CABIN AND AMBIENT OZONE MEASUREMENTS ON TWO BOEING 747 AIRPLANES. VOLUME 3: OCTOBER 1978 - JULY 1979
James D. Holdeman and William H. Jasperson (Control Data Corp., Minneapolis) Feb. 1985 579 p refs
(Contract DOT-FA78WAI-893)
(NASA-TM-86883; E-2344; NAS 1.15:86883) Avail: NTIS HC A25/MF A01 CSCL 04B

Measurements of ozone concentrations at cruise altitudes both outside and in the cabin of a Boeing 747SP and Boeing 747-100 airliners in routine commercial service are presented. Plotted and tabulated data are identified by route and are arranged chronologically for each airplane. These data were taken at 5- or 10-min intervals by automated instruments used in the NASA Global Atmospheric Sampling Program (GASP). All GASP cabin ozone data obtained from October 1978 to early July 1979 are presented. R.J.F.

N85-21873*# Pacific Northwest Lab., Richland, Wash.
ANALYSIS OF THE NASA/MSFC AIRBORNE DOPPLER LIDAR RESULTS FROM SAN GORGONIO PASS, CALIFORNIA Final Report
W. C. Cliff, J. R. Skarda, D. S. Renne, and W. F. Sandusky Dec. 1984 70 p refs
(Contract NAS8-34733)
(NASA-CR-171355; NAS 1.26:171355;) Avail: NTIS HC A04/MF A01 CSCL 04B

Two days during July of 1981 the NASA/MSFC Airborne Doppler Lidar System (ADLS) was flown aboard the NASA/AMES Convair 990 on the east side of San Gorgonio Pass California, near Palm Springs, to measure and investigate the accelerated atmospheric wind field discharging from the pass. The vertical and horizontal extent of the fast moving atmospheric flow discharging from the San Gorgonio Pass were examined. Conventional ground measurements were also taken during the tests to assist in validating the ADLS results. This particular region is recognized as a high wind resource region and, as such, a knowledge of the horizontal and vertical extent of this flow was of interest for wind energy applications. The statistics of the atmospheric flow field itself as it discharges from the pass and then spreads out over the desert were also of scientific interests. This data provided the first spatial data for ensemble averaging of spatial correlations to compute longitudinal and lateral integral length scales in the longitudinal and lateral directions for both components. Author

N85-21874*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHASE FUNCTION, BACKSCATTER, EXTINCTION, AND ABSORPTION FOR STANDARD RADIATION ATMOSPHERE AND EL CHICHON AEROSOL MODELS AT VISIBLE AND NEAR-INFRARED WAVELENGTHS
Charles H. Whitlock, John T. Suttles, and S. R. LeCroy (Kentron Intern., Inc., Hampton, Va.) Mar. 1985 57 p refs
(NASA-TM-86379; NAS 1.15:86379) Avail: NTIS HC A04/MF A01 CSCL 04B

Tabular values of phase function, Legendre polynominal coefficients, 180 deg backscatter, and extinction cross section are given for eight wavelengths in the atmospheric windows between 0.4 and 2.2 microns. Also included are single scattering albedo, asymmetry factor, and refractive indices. These values are based on Mie theory calculations for the standard rediation atmospheres (continental, maritime, urban, unperturbed stratospheric, volcanic, upper atmospheric, soot, oceanic, dust, and water-soluble) assest measured volcanic aerosols at several time intervals following the El Chichon eruption. Comparisons of extinction to 180 deg backscatter for different aerosol models are presented and related to lidar data. E.A.K.

N85-21875*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-51A) LAUNCH
D. L. Johnson, G. Jasper, C. K. Hill, and G. W. Batts (Computer Sciences Corp.) Dec. 1984 48 p refs
(NASA-TM-86497; NAS 1.15:86497) Avail: NTIS HC A03/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-51A launch time on November 8, 1984, are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is reported. The final atmospheric tape, which consists of wind and thermodynamic parameters versus altitude, for STS-51A vehicle ascent was constructed. The STS-51A ascent atmospheric data tape is constructed to provide an internally consistent data set for use in postflight performance assessments. E.A.K.

N85-21876*# Wisconsin Univ., Madison. Space Science and Engineering Center.
SPACE SHUTTLE INTERACTIVE METEOROLOGICAL DATA SYSTEM STUDY Final Report
J. T. Young, Robert J. Fox, John M. Benson, Joseph P. Rueden, and Robert A. Oehlkers Mar. 1985 34 p refs
(Contract NAS8-33799)
(NASA-CR-171418; NAS 1.26:171418) Avail: NTIS HC A03/MF A01 CSCL 04B

Although focused toward the operational meteorological support review and definition of an operational meteorological interactive data display systems (MIDDS) requirements for the Space Meteorology Support Group at NASA/Johnson Space Center, the total operational meteorological support requirements and a systems concept for the MIDDS network integration of NASA and Air Force elements to support the National Space Transportation System are also addressed. B.G.

N85-21877*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DIRECT-STRIKE LIGHTNING PHOTOGRAPHS, SWEPT-FLASH ATTACHMENT PATTERNS, AND FLIGHT CONDITIONS FOR STORM HAZARDS 1982

Klaus P. Zaepfel, Bruce D. Fisher, and Merle S. Ott Feb. 1985 249 p refs Prepared in cooperation with Lightning Technologies, Inc.

(Contract NAS1-15884)

(NASA-TM-86347; NAS 1.15:86347) Avail: NTIS HC A11/MF A01 CSCL 04B

As part of the NASA Langley Research Center Storm Hazards Program, 241 thunderstorm penetrations were made in 1982 with an F-106B airplane in order to record direct-strike lightning data and the associated flight conditions. During these penetrations, the airplane received 156 direct lightning strikes; in addition, lightning transient data were recorded from 26 nearby lightning flashes. The tests were conducted within 150 nautical miles of Hampton, Virginia, assisted by ground-based weather-radar guidance from the NASA Wallops Flight Facility. The photographs of the lightning attachments taken from two onboard 16-mm color movie cameras and the associated strike attachment patterns are presented. A table of the flight conditions recorded at the time of each lightning event, and a table in which the data are cross-referenced with the previously published lightning electromagnetic waveform data are included. Author

N85-21878*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A NEW NASA/MSFC MISSION ANALYSIS GLOBAL CLOUD COVER DATA BASE

S. C. Brown and W. R. Jeffries, III (Computer Sciences Corp., Huntsville, Ala.) Mar. 1985 17 p refs

(NASA-TP-2448; NAS 1.60:2448) Avail: NTIS HC A02/MF A01 CSCL 03B

A global cloud cover data set, derived from the USAF 3D NEPH Analysis, was developed for use in climate studies and for Earth viewing applications. This data set contains a single parameter - total sky cover - separated in time by 3 or 6 hr intervals and in space by approximately 50 n.mi. Cloud cover amount is recorded for each grid point (of a square grid) by a single alphanumeric character representing each 5 percent increment of sky cover. The data are arranged in both quarterly and monthly formats. The data base currently provides daily, 3-hr observed total sky cover for the Northern Hemisphere from 1972 through 1977 less 1976. For the Southern Hemisphere, there are data at 6-hr intervals for 1976 through 1978 and at 3-hr intervals for 1979 and 1980. More years of data are being added. To validate the data base, the percent frequency of $<$ or $=$ 0.3 and $>$ or $=$ 0.8 cloud cover was compared with ground observed cloud amounts at several locations with generally good agreement. Mean or other desired cloud amounts can be calculated for any time period and any size area from a single grid point to a hemisphere. The data base is especially useful in evaluating the consequence of cloud cover on Earth viewing space missions. The temporal and spatial frequency of the data allow simulations that closely approximate any projected viewing mission. No adjustments are required to account for cloud continuity. A.R.H.

N85-21879# Committee on Science and Technology (U. S. House).

WIND SHEAR DETECTION TECHNOLOGY

Washington GPO 1984 145 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 112, 25 Jul. 1984

(GPO-38-920) Avail: Subcommittee on Transportation, Aviation and Materials

Our understanding of wind shear, although limited, has progressed in recent years. In spite of this progress, however, low altitude wind shear continues to be a significant hazard to aviation. Thus, our objective to examine our current technical capability to detect wind shear, the status of the FAA's low level wind shear alert system implementation program, as well as the operational aspects of assuring that pilots have timely and accurate weather information en route, and especially on takeoff and landing. G.L.C.

N85-21880# Committee on Science and Technology (U. S. House).

HURRICANE STORM SURGE RESEARCH

Washington GPO 1984 207 p Hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 137, 9 Aug. 1984

(GPO-40-048) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

The most deadly hurricane force is the storm surge, an enormous dome of water, 50 miles across and up to 25 feet high, which is driven in front of the hurricane as it approaches land. It can sweep across barrier islands and engulf low lying coastal areas for miles and miles around. 12 hour hurricane warning is the most that the National Weather Service can provide under current technology. The feasibility of sheltering people can't be evacuated in highrise buildings designed and adapted to resist storm surges and other hurricane forces is examined. Surge forecast models, public awareness, and the inadequacy of funding to NOAA for further research are also discussed. A.R.H.

N85-21881# Systems Control Technology, Inc., West Palm Beach, Fla. Technology Industries Div.

EVALUATING WIND FLOW AROUND BUILDINGS ON HELIPORT PLACEMENT Final Report, Sep. 1983 - Aug. 1984

J. B. McKinley Washington, D.C. FAA Oct. 1984 45 p refs

(Contract DEFA01-80-C-10080)

(FAA-PM-84-25) Avail: NTIS HC A03/MF A01:

A heliport wind assessment methodology for evaluating and potentially minimizing the influences of building-induced wind on heliport operations is presented. Descriptions and illustrations of wind flow patterns and characteristics for both isolated and multiple building configurations are provided to assist heliport planners, operators, and helicopter pilots in understanding the problems associated with building-induced winds. Based on geometric flow patterns, general guidelines for ground level and rooftop heliport placement are provided. Additional guidelines for determining the area of wind influence about isolated and multiple building configurations are detailed. Rules for calculating the distance from the sides of buildings for heliport siting is provided, as well as, rules for calculating the area of influence of buildings with respect to the prevailing climatic wind conditions. Recommendations are delineated for further data gathering and evaluation to validate and enhance the heliport wind assessment methodology. Author

N85-21882# Danish Meteorological Inst., Copenhagen. Air Pollution Section.

SECTOR ANALYSIS OF RELEVANT METEOROLOGICAL PARAMETERS FOR LONG RANGE TRANSPORT OF AIR POLLUTANTS Final Report

Hans Buch 1984 35 p refs

(NR-27) Avail: NTIS HC A03/MF A01

Some results of a statistical analysis of certain meteorological parameters relevant for long range transport of air pollutants are presented. The calculations were based on about 5 years of data from 8 radiosonde stations in or around Denmark. For each radiosonde station and for each observation hour (00z and 12z) were calculated 850 mb geostrophic trajectories 48 hours backward in time, and each trajectory was allocated to one of 9 groups, namely 8 trajectory sectors of 45 deg NE, E, SE, ...) and a 9th group containing all the trajectories, which could not be allocated to one of the 8 sectors of 45 deg. The meteorological parameters obtained from the radiosonde data were mixing height, vertical mean values of wind speed and of relative humidity, and a special stability parameter for the lowest layer of the atmosphere. For each of these groups were calculated different kinds of mean values of the meteorological parameters mentioned above. The results show, that the meteorological parameters in most cases vary greatly from one trajectory sector to another. B.W.

N85-21883# Finnish Meteorological Inst., Helsinki.

ON THE WIND ERROR OF THE FINNISH RAINGAUGE

Bengt Tammelin 1984 61 p refs In FINNISH; ENGLISH summary

(Rept-37) Avail: NTIS HC A04/MF A01

In snowfall measurements using the standard Finnish rain-gauge, the wind error is a very significant factor. Both wind tunnel and field tests show that the shape and size of the gauge change the trajectories of precipitation particles. As a result of this, the density of trajectories leading into the gauge is reduced. The characteristics of the gauge are such that splashing-out is also possible. The occurrence of this depends strongly on wind speed when the relative humidity is less than 90%. By taking into account the wetting loss, splashing-out and the efficiency of catch of the gauge, the rainfall amount recorded in individual cases can be corrected, leading to a reduction in overall error in precipitation measurement by over 50% to a value of 3 - 4%. In an open situation, more trustworthy overall results from the point of view of daily rainfall totals can be obtained by surrounding the stan-dard gauge with a double slat fence. Author

N85-21884# Meteorological Satellite Center, Tokyo (Japan).
METEOROLOGICAL SATELLITE CENTER TECHNICAL NOTE NO. 10, 1984
Nov. 1984 92 p refs In JAPANESE; ENGLISH summary (MSC-TN-10; ISSN-0388-9653) Avail: NTIS HC A05/MF A01

The use of satellites in determining the relative motion, intensity, and location of the eye of typhoons is assessed. Brightness temperatures recorded by various satellite-borne radiometers are compared. The processing of NOAA AVHRR imagery and its application to sea surface temperature; the subsynoptic cloud system off the south coast of Japan; and calibrating GMS and VISSR are discussed. For individual titles, see N85-21885 through N85-21893.

N85-21885# Meteorological Satellite Center, Tokyo (Japan).
ON THE RELATIVE MOTION OF TYPHOONS: IN THE CASE OF TYPHOON 8305 AND TYPHOONS 8306 AND 8307
Nobutoshi Fuchita *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 1-8 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

Typhoons 8305, 8306 and 8307 showed relative motion in GMS images and in its tracks. This is not a simple relative motion of typhoon pairs, but a simultaneous interaction of these three tropical cyclones. Typhoon 8306 was analyzed as a tropical depression on 06 GMT 11th, and began to interact with Typhoons 8305. Separation distance between them was about 1500 km in that time. On the other hand Typhoon 8307 showed the relative motion from 03 GMT 13th. It was nine hours before the storm was analyzed as a tropical storm. The relative motion continued for 96 hours till the two typhoons 8306 and 8307 respectively dissipated. They rotated in a counterclockwise sense around a point (a graivty center which was calculated from those three typhoon's centers). Typhoons 8306 and 8307 were brought under influence of Typhoon 8305, and dissipated in the large vortical clouds. Some features seen in the images of GMS during the relative motion are as follows; Typhoon 8305 had a distinct eye with circular-like cloud area. The two tropical storms rotating that typhoon has an irregular shaped, indistinct eye. That was due supposedly to the tropical storms being under the influence of the Typhoon 8305. Author

N85-21886# Japan Meteorological Agency, Tokyo.
ON THE ERROR OF TYPHOON INTENSITY ESTIMATION BY MEANS OF IR DVORAK TECHNIQUE OCCURRING WHEN THE EYE IS VERY SMALL
Kenji Shimada *In* Meteorological Satellite Center Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 9-14 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

A case study was made on the error of typhoon intensity by means of IR Dvorak technique occurring when the eye is very small. The IR Dvorak technique estimated the intensity weaker than the actual one by 0.5 to 1.0 T number in case of Typhoon 8210 when it had a very small eye of about 5 n.m. in diameter. This is due to the brightness temperature in the eye observed by GMS is lower than the real one because a part of the wall clouds is included in the instant field of view of the infra-red radiometer of GMS. Author

N85-21887# Meteorological Satellite Center, Tokyo (Japan).
ACCURACY OF TYPHOON CENTER DETERMINED BY GMS IMAGERY
Takeshi Hagiwara *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 15-18 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

The accuracy of GMS-centers depend on cloud pattern, especially, on cloud feature around center of tropical cyclones. Some 355 cases of GMS-center from best tracks for each types were carried out. Results show: (1) when tropical cyclones have eyes, deviations of GMS-centers are almost within 0.5 deg lat./lon., furthermore, in cases of distinct eye deviations within 0.3 deg. lat./lon. are 85%; (2) when determined centers are very accurate, GMS-centers are apt to locate on NE quadrant of best tracks; and (3) when tropical cyclones have cloud structures suggesting center, deviations of GMS-centers are almost 1 deg. lat./lon., and in cases of no such cloud structures neither, 20% of deviations are beyond 1 deg. lat./lon. Author

N85-21888# Meteorological Satellite Center, Tokyo (Japan).
AN ANALYSIS OF THE DATA OBTAINED BY A SIMULTANEOUS OBSERVATION OF GMS AND GMS-2: A STUDY OF THE DIFFERENCE BETWEEN THE BRIGHTNESS TEMPERATURES BY GMS AND THOSE BY GMS-2
Akinori Ichiki, Masaaki Togashi, and Akihiro Uchiyama *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 19-28 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

On the basis of data from a simultaneous observation of GMS (160 deg E) and GMS-2 (140 deg E), the difference between the brightness temperatures (TBBs) obtained from two geostationary meteorological satellites was analyzed. Both observed TBB and the theoretically calculated TBB (in the case of GMS) were compared with those in the case of GMS-2. The difference between TBBs is attributed to the effect of the different filter response functions of two (visible and infrared spin scan radiometers (differences of about 0.5-1.6 K for the area (90 deg E-170 deg W, 0 -50 deg N) by use of geostationary meteorological satellite standard atmosphere data). In addition, the differences between the IR calibrations of two satellite radiometers is about 0.5 K in low temperature region (222-230 K) and about 1 K in high temperature region (291-296 K). A.R.H.

N85-21889# Meteorological Satellite Center, Tokyo (Japan).
VISSR INFRARED CALIBRATION BY MEANS OF CALCULATED RADIANCES
Akihiro Uchiyama, Akinori Ichiki, and Taichi Takahashi *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 29-36 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

The current routine infrared calibration procedure is performed once a day. Because of the thermal gradient within the sensor scanner unit, infrared data are not well calibrated. The equations to compute a effective shutter temperature are statistically determined on the basis of the data set of theoretically calculated radiances and telemetry data. The differences between the current routine shutter temperatures and the new shutter temperatures are greater than 1 K from the late of April to the middle of August. However, the new shutter temperature is used operationally, because of difficulties in evaluating the error of theoretical calculation. Author

N85-21890# Meteorological Research Inst., Tokyo (Japan). Upper Atmosphere Physics Div.
ON THE P1 DATA FROM GMS-SEM
Tsugunobu Nagai *In* Meteorological Satellite Center Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 37-46 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01:

The count rate of the lowest energy channel P1 (1.2-4 MeV protons nominal) of the space environment monitor on the Geostationary Meteorological Satellite is compared with the proton intensity derived from U.S. spacecraft observations. It is found that the channel P1 count rate is almost always abnormally high. It is also found that the channel P1 count rate corresponds feature by feature to the energetic electron intensity derived from channel EL (> 2 MeV electrons). This analysis indicates that energetic electrons are a significant contaminant in the proton channel P1.
Author

N85-21891# Meteorological Satellite Center, Tokyo (Japan).
THE DEVELOPMENT OF IMAGE PROCESSING OF NOAA AVHRR DATA AND ITS APPLICATION TO SEA SURFACE TEMPERATURE
Masami Tokuno and Sachio Takahashi *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 47-56 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

Satellite data from the Advanced Very High Resolution Radiometer (AVHRR) on board NOAA have been used to detect areas of clouds or to investigate surface conditions. In order to use NOAA AVHRR imagery effectively, a system was developed to display the imagery on an Image Processing Console (IPC). The system has the following functions: (1) enlarging or compressing the image; (2) constructing the image by the enhancement conversion table; and (3) monocolor or pseudo color display of the image. As an example of its application, features of sea surface temperature patterns were studied three times in the ocean off the Sanriku Shore. A large warm eddy detached from the Kuroshio was noticed.
Author

N85-21892# Meteorological Satellite Center, Tokyo (Japan).
A SUPPLEMENT STUDY ON THE SUBSYNOPTIC CLOUD SYSTEM OFF THE SOUTH COAST OF JAPAN
Yoichi Mitate and Michio Hitsuma *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 57-60 refs (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

The development of the cloud system in using IR (infrared) pixels taken by GMS and the operational numerical prediction data disseminated by JMA. Results show: (1) the cloud area expands its area remaining its cloud top low in the first place, and thereafter develops in cloud top height not gradually but suddenly; (2) development of the cloud system occurs when a positive maximum vorticity on 500 mb level came to a place 1500 km to the west- to northwest of that subsynoptic cloud system center; (3) a typical large-scale situation is when a well developed cold vortex locates in the Okhotsk Basin, as another cold vortex is traveling from the west to the eastern part of China. It seems that tracing of a postive maximum vorticity on 500 mb level is good clue to forecast the development of the cloud system because it is usually easy to trace.
Author

N85-21893# Meteorological Satellite Center, Tokyo (Japan).
GMS OPERATIONAL CALIBRATION PROCEDURE AND STATUS
Akihiro Uchiyama *In its* Meteorol. Satellite Center Tech. Note No. 10, 1984 Nov. 1984 p 85-92 Presented at the ISCCP Working Group on Data Management Plan Meeting, Tokyo, 6-8 Mar. 1984 (For primary document see N85-21884 12-47)
Avail: NTIS HC A05/MF A01

The operational calibration procedure of the Visible and Infrared Spin Scan Radiometer (VISSR) and the present calibration status are summarized. The infrared calibration procedure utilizes space and the calibration shutter as the reference targets. Judging from the thermal gradient within the sensor scanner unit, infrared data are not well calibrated. The visible calibration procedure, which utilizes space and the sun as the reference targets is not performed operationally up to the present. A normalization procedure is carried out to reduce the stripes instead of the visible calibration procedure. The prepared conversion table of count values to albedo for the reference channel is fixed at present.
Author

N85-21894*# Control Data Corp., Minneapolis, Minn. Meteorology Research Center.
ANALYSIS OF SELECTIVE CHOPPER RADIOMETER DATA Final Report
J. Roe, D. Hovland, and R. Wilcox 15 Sep. 1983 57 p refs
(Contract NAS5-27663)
(NASA-CR-175157; NAS 1.26:175157) Avail: NTIS HC A04/MF A01 CSCL 04B

Data from SCR-B on Nimbus 5 have been processed to yield global, orbital temperatures at 10, 5, 2, 1, and 0.4 mb for the period January 1977 through April 1978 under the current task. In addition gridded values at 10 deg latitude by 20 deg longitude were prepared by space-time interpolation for the period January 1975 through April 1978. Temperature retrieval was based on regression of radiances against Meteorological Rocket Network data, with regressions recomputed at approximately six-month intervals. This data now completes a consistent time series from April 1970 to April 1978 for all available radiance data from SCR A and SCR B on Nimbus 4 and 5. The processing details for the current period are discussed, but is also applicable to the previous data periods. The accuracy of the temperature retrievals for each 6-month period for the entire eight years is given in the Appendices.
B.W.

N85-21895# Colorado State Univ., Fort Collins.
VARYING STRUCTURE AND INTENSITY CHANGE CHARACTERISTICS OF 4 WESTERN NORTH PACIFIC TROPICAL CYCLONES Final Report
C. A. Askue and W. M. Gray Oct. 1984 107 p
(Contract N00014-83-K-0002)
(AD-A149628; NEPRF-CR-84-08) Avail: NTIS HC A06/MF A01 CSCL 04/2

Observational case studies of four tropical cyclones (Ellis, Hope, Judy, and Roger) from birth to decay are made using a variety of data sources from the First GARP Global Experiment (FGGE) year (1979). Each of these cyclones had uniquely different characteristics. Two became supertyphoons, one only a weak typhoon, and one only a tropical storm with a strong outer circulation. Two recurved, and two did not recurve. Information was derived from a combination of European Centre for Medium Range Weather Forecasts (ECMWF) large scale objective analyses, Joint Typhoon Warning Center (JTWC) Guam manual analyses, National Climatic Center (NCC) analyses published by the National Oceanic and Atmospheric Administration (NOAA), United States Air Force (USAF) aircraft reconnaissance data, and U.S. Defense Meteorological Satellite Program (DMSP) military satellite imagery. The combination of these rich data sources allowed a quantitative description of both large and small scale features. Emphasis is placed on cyclone structure and intensity change. Quantitative assessments of the varying relationships between inner and outer radii wind parameters are made. Preliminary results show the importance of the large scale (radius greater than seven degrees) environment in determining cyclone genesis and the importance of upper tropospheric outflow patterns in determining cyclone inner-core intensity change.
GRA

N85-21896# Coastal Engineering Research Center, Vicksburg, Miss.
HURRICANE ALICIA STORM SURGE AND WAVE DATA Final Report
A. W. Garcia and T. H. Flor Nov. 1984 94 p
(AD-A149668; CERC-84-6) Avail: NTIS HC A05/MF A01 CSCL 04/2

A summary of storm surge highwater mark hydrograph and wave data acquired during and subsequent to Hurricane Alicia is presented. The data were obtained and assembled as part of a long-term research effort by the Corps of Engineers to establish a quantitative data set with the objective of providing, in a series of documents, the data necessary for simulation and verification of numerical surge models. The data contained herein were obtained primarily by the Waterways Experiment Station and the Galveston District of the Corps of Engineers with supplemental data from contributing agencies and institutions. Additional information is

included in the form of photographs and descriptive narrative to aid investigators in assessing the degree of importance of an individual measurement for the purpose of model verification. GRA

N85-21897# Schmitt (Rainer), Glashutten (West Germany).
INVESTIGATIONS OF MICRO-TURBULENCE IN THE BOTTOM OF THE BOUNDARY LAYER Interim Report, Aug. 1983 - Oct. 1984
R. Schmitt Oct. 1984 39 p
(Contract DAJA45-83-C-0038; DA Proj. 1T1-61102-BH-57)
(AD-A149823; IR-2) Avail: NTIS HC A03/MF A01 CSCL 04/2

Data representing preliminary first measurements of turbulence are presented, along with parallel meteorological data. Instrumentation problems are discussed, and the computer code for data reduction is provided. This report deals with the first series of measurements in Western Germany. The data are presented and the weather maps are added. The measuring site in northern Germany had to be changed due to two reasons: (1) one farmer revoked the permission to work on his ground, (2) the area was unsecured at one end of the optical path. GRA

N85-21898# Environmental Research and Technology, Inc., Concord, Mass.
TIME AND SPACE VARIABILITY OF TURBULENT CONCENTRATION FLUCTUATIONS Final Report, 3 Jan. 1983 - 2 Jan. 1985
S. R. Hanna 31 Dec. 1984 32 p
(Contract DAAG29-83-C-0005)
(AD-A149963; ARO-19893.4-GS) Avail: NTIS HC A03/MF A01 CSCL 04/2

Models for concentration fluctuations in atmospheric smoke plumes are reviewed and a simplified model developed. The new model is shown to agree well with Smoke Week III data and fluid modeling data. Keywords include: Turbulence, Diffusion, Concentration fluctuations, and Smoke Week experiments. GRA

N85-21899# Science Applications, Inc., McLean, Va.
INTENSIFICATION OF TROPICAL INSTABILITIES Final Report
E. B. Hyman Sep. 1984 55 p
(Contract N00014-83-C-2231)
(AD-A149985; AD-E001789; SAIC-84/1320) Avail: NTIS HC A04/MF A01 CSCL 04/2

Important progress has been made in two fronts. SAIC has finished the study of the influence of horizontal and vertical wind shears on the development of tropical disturbances. Second, a new computational method has been devised for economical integration of geophysical fluids with barotropic components. The two reports describing these studies are attached as appendices to this report. GRA

N85-21900# Bohan (Walter A.) Co., Park Ridge, Ill.
NAVY TACTICAL APPLICATIONS GUIDE. VOLUME 4. PART 1. EASTERN NORTH PACIFIC WEATHER ANALYSIS AND FORECAST APPLICATIONS
Robert W. Fett (Naval Environmental Prediction Research Facility), Walter A. Bohan, and Jay Rosenthal (Pacific Missile Test Center) Jun. 1984 211 p
(Contract N00228-82-C-6222)
(AD-A150097; NEPRF-TR-83-01) Avail: NTIS HC A10/MF A01 CSCL 04/2

A detailed presentation on the subject of Blocking over the eastern North Pacific is provided combining geostationary satellite evidence with conventional charts, analyses, and forecasts. Every stage in the life cycle of the block from the initiation through development and dissipation is clearly depicted. The effects of steering of cyclonic disturbances by a block and the formation of cut-off lows downstream of blocking highs are also presented. The subject of Cyclogenesis in the eastern North Pacific is additionally described in which three separate types of cyclogenesis based on satellite analysis are clearly defined. These types differ considerably from classic models but are readily identifiable in sequences of geostationary satellite imagery. The usefulness of water vapor imagery in synoptic analysis and in defining the location of the Tropical Upper-Tropospheric Trough (TUTT) is shown. Finally, a section devoted to selected Coastal Zone Phenomena is presented, illustrating diurnal effects in the dissipation of coastal stratus and important observations concerning the formation of the Catalina Eddy. GRA

N85-21901# Lowell Univ., Mass. Dept. of Earth Science.
STUDIES OF THE DEVELOPMENT OF CYCLONES OVER SOUTHERN CHINA COASTAL AREAS AND ADJACENT SEAS
Tang Wen Nov. 1984 186 p Sponsored in part by NSF
(Contract N00014-81-C-0359)
(AD-A150108) Avail: NTIS HC A09/MF A01 CSCL 04/2

A number of meteorological factors contribute to the genesis and development of low pressure systems in this area in the spring. When the Southwest monsoon season starts in April, warm moist air begins its invasion from the Indian Ocean northward into South China. Storms usually develop as the warm moist air encounters the cold, dry air mass from the north. Topography also plays a great role in cyclone development. China's high plateau to its west and complex terrain to the south complicates the circulation. Our study stresses the thermo-hydrodynamics of cyclonic circulations. A number of cyclogenetic cases were selected; maps at different levels for each case were analyzed. Based on the equations of our theoretical model, each term in the equations was measured from the maps and tabulated. Statistical analysis and interpretation of these data show that the most important contribution factors are the baroclinic and the condensational heating effects. An analytical and theoretical model was developed in order to determine how the presence of the Tibetan Plateau and other factors affect the cyclogenesis. Solution under linearized conditions was obtained and the 500 mb trough position was in general agreement with observations. GRA

N85-21902# Pacific Northwest Lab., Richland, Wash.
NON-PRECIPITATING CUMULUS CLOUD STUDY
A. J. Alkezweeny Oct. 1984 30 p refs
(Contract DE-AC06-76RL-01830)
(DE85-002352; PNL-5283) Avail: NTIS HC A03/MF A01

The vertical transport of acidic pollutants by cumulus convection and formation of acidic substances in nonprecipitating clouds was determined. The vertical transport was examined SF6 tracer from one aircraft, sampling by another aircraft, and then by releasing a sampling on the ground. It is shown that pollutants from the boundary layer are lifted to the cloud layer. From there, they are intermittently transported both to the ground and to higher elevations, possibly in the vertical updrafts of towering cumulus clouds. The formation of acidic aerosols was studied. The concentrations of SO2, SO4, NO3, NH4, NH3, HNO3 and trace metals were measured by filter techniques. Furthermore, NO (sub x), O3, light scattering, and basic meteorological parameters were measured in real-time and the chemical composition of aerosols and NH3 was also measured on the ground. It is shown that the molar ratio of SO2 (SO2 + SO4) at cloud tops is higher than at cloud bases. This indicates that sulfate aerosols were formed in the clouds. The NH3 concentration shows higher values at nighttime than daytime and decreases sharply with increasing altitude. DOE

N85-21903# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS MINI-REVIEW: TRACKING ANTARCTIC WINDS
Eugene J. Mroz Oct. 1984 4 p
(Contract W-7405-eng-36)
(DE85-004597; LALP-84-51) Avail: NTIS HC A02/MF A01

This Mini-Review summarizes ongoing research on Antarctic winds. The circumpolar and Katabatic flows are discussed. In addition the use of tracers in flowing wind flow is addressed. DOE

N85-21904# California Univ., Livermore. Lawrence Livermore Lab.
OCEANIC ROLE IN TERRESTRIAL CLIMATE
Hugh W. Ellsaesser Nov. 1984 22 p refs Presented at the 13th Intern. Conf. on the Unity of the Sci., Washington, D.C., 2-5 Sep. 1984 Submitted for publication

(Contract W-7405-eng-48)
(DE85-004422; UCRL-91451; CONF-8409184-1) Avail: NTIS HC A02/MF A01

A review is given of the role of the oceans in terrestrial climatogenesis. The review leads to development of a criterion for recognizing areas of potential climatogenesis through atmosphere oceanic interaction and to speculations as to the causes of the El Nino-Southern Oscillation events, the Medieval Little Optimum, Little Ice Age and 20th Century Arctic Warming of the North Atlantic and the glacial-interglacial cycles. DOE

N85-21905# Royal Netherlands Meteorological Inst., De Bilt. Dynamische Meteorologie.
ON THE RELATIONSHIP BETWEEN MAXIMUM SURFACE TEMPERATURE AND VARIOUS PARAMETERS; WITH REFERENCE TO OBJECTIVE FORECASTING
A. W. Hanssen 1984 15 p refs
(KNMI-TR-58; B8477105; ISSN-0169-1708) Avail: NTIS HC A02/MF A01

It was found that a useful indication of maximum temperature may be obtained from the midday 1000 to 500 mb thickness, the surface wind direction, the sunshine total and the month. The relationship represents a mean reduction of variance of 75% (during April-October). This gives an rms error of 1.9 C. The quality of temperature forecasts made on the basis of the relationship are mainly determined by the quality of the thickness (1000 to 500 mb) forecasts. Author (ESA)

N85-21906# Delphi Research Associates, Inc., Washington, D.C.
IMPACT OF AEROSOLS ON VISIBILITY AND CLIMATE: A REPORT PREPARED FOR PANEL 3, ENVIRONMENTAL IMPACT, OF THE NATO/CCMS AIR POLLUTION PILOT STUDY ON AIR POLLUTION CONTROL STRATEGIES AND IMPACT MODELLING Final Report
Tonette Inge, B., Paul vonWard, and F. Vandiver Bradow (EPA, Research Triangle Park, N.C.) Sep. 1984 57 p refs
(PB85-106744; EPA-600/D-84-242) Avail: NTIS HC A04/MF A01 CSCL 04B

This U.S. contribution to a report being prepared by Panel 3, Environmental Impact, of The Air Pollution Pilot Study on Control Strategies and Impact Modelling, NATO Committee on the Challenges of Modern Society is a representative collection of research findings and key data on aerosol impact on visibility and climate in the United States. Sulfate and elemental carbon are emphasized with minor contributors being mentioned. Sections on impact of visibility and impact on climate include many illustrators of secular trend data. The potential economic impact, especially in terms of agricultural effects is addressed. GRA

N85-21907# National Weather Service, Salt Lake City, Utah.
COLLECTION AND USE OF LIGHTNING STRIKE DATA IN THE WESTERN US DURING SUMMER 1983
G. E. Rasch and M. Mathewson Feb. 1984 42 p refs
(PB85-110534; NOAA-TM-NWS-WR-184) Avail: NTIS HC A03/MF A01 CSCL 04B

Since 1977, the Bureau of Land Management (BLM) has operated an Automatic Lightning Detection System (ALDS) in the western United States. The primary use of the system has been by the BLM and other land management agencies for the detection of lightning caused wildfires. The system is designed to detect cloud-to-ground strikes only. During the summer of 1982, the NWS's Western Region conducted an experiment to determine: (1) if the lightning strike data could be rapidly and economically distributed and displayed at NWS offices, and (2) whether or not the data were useful as diagnostic and forecasting tools. The experiment was confined to a small portion of the overall BLM system. It consisted of two of the twelve separate lightning networks operated by the BLM. The strikes were processed in real-time by a Nova 4/X minicomputer. Author (GRA)

N85-21908# National Weather Service, Garden City, N.Y.
FTASUM: AVIATION FORECAST SUMMARIES
M. R. Peroutka Aug. 1985 24 p refs
(PB85-112977; NOAA-NWS-ERCP-25) Avail: NTIS HC A02/MF A01 CSCL 04B

Aviation terminal forecasts are generally logged by hand onto Weather Service Form D-7 along with their associated surface observations. In past years, the purpose of this log was to help the forecaster keep up with the weather. Maintaining this sort of log is time-consuming and cumbersome, and the log does not reflect the entire aviation picture. This paper describes a program which uses the AFOS database to produce a complete log sheet. All forecasts and observations which occur during a given time window are printed in chronologic order. Each site can specify three time windows and the time of day during which each window is used. GRA

N85-21909# National Weather Service, Garden City, N.Y.
SAOSUM: A SHORT SUMMARY OF OBSERVATIONS
Matthew R. Peroutka Oct. 1984 21 p
(PB85-120384; NOAA-NWS-ERCP-26) Avail: NTIS HC A02/MF A01 CSCL 04B

A program which quickly produces a list of all the observations taken at a group of stations during the past eight hours is described. The program can help meteorologists prepare their forecasts and monitor the weather, but its main purpose is to brief a forecaster who has just started his or her shift. The program is written in Data General's FORTRAN IV, and it runs in the background partition of the Eclipse minicomputer. GRA

N85-21910*# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.
PRELIMINARY RESULTS OF ASSOCIATING CLOUD-TO-GROUND LIGHTNING WITH SURFACE CONVERGENCE AND RADAR REFLECTIVITY AT KENNEDY SPACE CENTER IN 1983
Andrew I. Watson, Raul E. Lopez, Ronald L. Holle, and John R. Daugherty Jul. 1984 93 p refs Sponsored in part by NASA
(NASA-CR-175543; NAS 1.26:175543; PB85-128353; NOAA-TM-ERL-ESG-7) Avail: NTIS HC A05/MF A01 CSCL 04B

The association of cloud to ground lightning with prior surface convergence was studied at Kennedy Space Center for several days during the summer of 1983. Earlier studies in south Florida using large data sets had showed that surface convergence was associated with radar derived precipitation, and that radar reflectivity was associated with cloud to ground lightning. Therefore, it was expected that convergence could be used to anticipate lightning on short time scales. The cases in 1983 are presented to indicate that such relationships from south Florida also apply at KSC. GRA

N85-21911# National Weather Service, Garden City, N.Y. Forecast Office.
TRAJ: SINGLE STATION TRAJECTORY PLOT
Tom Nialol Dec. 1984 22 p refs
(PB85-135002; NOAA-NWS-ERCP-27) Avail: NTIS HC A02/MF A01 CSCL 04B

This computer program generates an AFOS plot of the NMC Three Dimensional Trajectory forecast for a single station. The Three Dimensional Trajectory Model was developed to attain greater accuracy in the prognosis of temperature and moisture distribution below 700mb. Prior to AFOS, the forecaster routinely plotted up the information manually from the trajectory bulletin. With the advent of AFOS, it is possible to plot the data automatically. More important, however, is the ability to overlay the Trajectory graphic onto other compatible AFOS graphics. The trajectory forecast becomes a more valuable product because it can be used interactively with other NMC products that are stored as AFOS graphics. GRA

N85-21912# National Weather Service, Silver Spring, Md. Techniques Development Lab.
AFOS (AUTOMATION OF FIELD OPERATIONS AND SERVICES)-ERA FORECAST VERIFICATION, SEPTEMBER 1984
Robert L. Miller, Mary M. Heffernan, and David P. Ruth Sep.

1984 50 p refs
(PB85-137578; NOAA/NWS-TDL-CP-84-3) Avail: NTIS HC A03/MF A01 CSCL 04B

The National Weather Service (NWS) has implemented a national forecast verification system which utilizes the processing and communication capabilities of the Automation of Field Operations and Services (AFOS) system. This AFOS-era forecast verification (AEV) system is a major step in implementing the National Verification Plan and replaces two existing national verification programs. Local and guidance forecasts of public and aviation elements are verified for two forecast cycles per day. The AEV system is designed to collect and collate forecasts and observations to provide a local, quality controlled database; to transmit data to a central site; to provide a permanent central archive; and to produce local, regional, and national summaries. GRA

N85-21913# National Weather Service, Silver Spring, Md. Techniques Development Lab.
AFOS (AUTOMATION OF FIELD OPERATIONS AND SERVICE) SURFACE OBSERVATION DECODING
Herman P. Perrotti Sep. 1984 40 p refs
(PB85-137586; NOAA-NWS-TDL-CP-84-2) Avail: NTIS HC A03/MF A01 CSCL 04B

A significant amount of the communications traffic transmitted over the Automation of Field Operations and Service (AFOS) network is surface observations. These observations are used by forecasters for visual analysis and as input to locally run FORmula TRANslation (FORTRAN) computer programs. Before the data can be used by these programs for mathematical computations, they must be converted from American National Standard Code for Information Interchange (ASCI) to numerical form. Applications programs capable of running in the background partition of the AFOS hardware written to standardize the conversion of these data. These programs can be run locally as stand alone tasks or their subroutines can be incorporated into other computer programs. One of the primary uses of surface observations at local AFOS sites is to display them on specified map backgrounds for synoptic analysis. Many sites create synoptic displays each hour during inclement weather. To create these displays, four programs are included in the standard package generally referred to as the SAO Decoder. GRA

N85-21914# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
STUDIES OF THE MECHANISMS AND RATES WITH WHICH NITROGEN SPECIES ARE INCORPORATED INTO CLOUD WATER AND PRECIPITATION Annual Report
D. A. Hegg and P. V. Hobbs Oct. 1984 58 p refs
(PB85-144350; CRC/APRAC/CAPA-21-80-04) Avail: NTIS HC A04/MF A01 CSCL 04B

In view of the current lack of understanding of the processes involved in the production of acid rain, the Cloud and Aerosol Research Group of the University of Washington is undertaking a study for the Coordinating Research Council of the role of clouds in the incorporation of nitric acid into rain. The principal objective of the study is to determine which of several possible mechanisms dominates the incorporation of nitrate into cloud water. In addition, a number of ancillary objectives (e.g., comparisons of the sources of nitrate and sulfate in cloud water) are being addressed. The data that have been used for preliminary assessments during the first year of the project can be divided into four basic sets. GRA

N85-21915# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR JANUARY 1985, VOLUME 39, NUMBER 1
29 Dec. 1984 10 p
(PB85-148799) Avail: NTIS HC A02/MF A01 CSCL 04B

The weather maps which gives the numerical probability estimates for seasonal temperature and precipitation in North America are given. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-21916# Oregon State Univ., Corvallis. Coll. of Oceanography.
CARBONATE CHEMISTRY OF THE WEDDELL SEA
Chen-Tung A. Chen Mar. 1984 132 p refs
(Contract DE-AT06-81EV-10611)
(DOE/EV-110611/4; TR008) Avail: NTIS HC A07/MF A01

Concurrent pH, calcium and total alkalinity data were obtained in the eastern Weddell Sea in the late austral Winter of 1981 as part of the US-USSR Weddell Polynya Expedition aboard the Soviet icebreaker SOMOV. These data represent the initial concentrations of calcium, alkalinity and total CO2 in the most important source region of world ocean bottom waters at the time they were formed. For the first time the variation of calcium and carbon cycles in the deep oceans referenced to the source water can be evaluated. The Weddell Sea data were analyzed with data reported in the literature, and the results are presented. Author

N85-21917# Coast Guard, Washington, D.C.
REPORT OF THE INTERNATIONAL ICE PATROL SERVICES IN THE NORTH ATLANTIC OCEAN, SEASON OF 1982
28 Feb. 1984 37 p
(AD-A149595; USCG-BULL-68; USCG-188-37) Avail: NTIS HC A03/MF A01 CSCL 08/12

Ice conditions in the North Atlantic are discussed. Environmental conditions, participating vessels, and oceanographic conditions are given. Numerous maps show the locations of ice bergs. R.J.F.

N85-21918# Washington Univ., Seattle. Applied Physics Lab.
CIRCULATION AND INTERNAL WAVES IN A COLD GULF STREAM WAVES Final Report
T. B. Sanford Oct. 1984 22 p
(Contract N00014-84-C-0187)
(AD-A149704) Avail: NTIS HC A02/MF A01 CSCL 08/3

Under this program an existing salt-bridge GEK was refurbished and used extensively in the Florida Current and Gulf Stream. The purposes of these measurements were to measure the ambient electric field in the ocean and to determine from a moving vessel the voltage differences across the Current and Stream. The experiment was conducted as part of a joint ONR-NOAA sponsored cruise on the USNS Lynch. The GEK is a device to measure the voltage between two points at or near the sea surface at separations of about 16 m. The velocity component of the ocean normal to the ship's heading was determined by tracking several LORAN-C stations using a precise receiver, Internav LC404, in a range-range mode. The accuracy of the LORAN system developed for this work is estimated to be about 1 cm/s over 5 minute intervals. The vessel's gyrocompass was used to determine heading. The plan for the Lynch cruise was to conduct several joint axcp and Pegasus stations, traverse the Florida Current on reciprocal courses several times, conduct an experiment to measure depth-averaged vorticity in the Current and survey a cold core ring in the Sargasso Sea. The goals of the measurements were to test the wave-mean flow interaction theory of Kunze (1984) and to describe the baroclinic and baratropic structure of a cold-core ring from underway measurements. Using the techniques described above it was possible to discover and map the feature in terms of temperature and velocity. The velocity information is notable and the innovation of this particular research and cruise. GRA

N85-21919# Naval Postgraduate School, Monterey, Calif.
PRELIMINARY RESULTS OF THE OCEANOGRAPHIC CRUISE OF USCGC NORTHWIND TO THE GREENLAND SEA Interim Report, 1 Aug. - 31 Dec. 1984
R. H. Bourke Dec. 1984 40 p
(AD-A149802; NPS68-84-019) Avail: NTIS HC A03/MF A01 CSCL 08/10

This interim report describes the cruise of the Coast Guard

ice breaker NORTHWIND (WAGB-282) to the continental shelf area of the Greenland Sea during August and September 1984. This cruise has been designated Arctic East 1984 (AE84), but for continuity with past cruises is also termed MIZLANT 84. The cruise had two primary objectives: (1) to map the bathymetry of the shelf between 76 N and 82 N, and (2) to conduct CTD soundings in these waters to establish the circulation and water mass structure over the troughs and shoals of the shelf. Because of very light ice conditions, both of these objectives were completely met. The NORTHWIND track covered over 6500 km (3500 miles) providing continuous depth soundings over the entire track. Over 300 CTD stations were made while on the shelf, most conducted at 10-15 km intervals in the high interest areas of the troughs, coastal region and other areas of rapidly changing bottom depth. GRA

N85-21920# Colorado School of Mines, Golden. Dept. of Geophysics.
RESEARCH ON OCEAN FLOOR ELECTRICAL SURVEYS Final Report
G. V. Keller and A. A. Kaufman 1 Oct. 1984 37 p
(Contract N00014-80-C-0768)
(AD-A149831) Avail: NTIS HC A03/MF A01 CSCL 08/14

An important problem faced by the U.S. Navy is that of detecting submarines at greater ranges with airborne magnetic sensors than can now be done. One of the limits to the range at which detection is possible is the confusion of submarine-generated signals with natural-field pulsations of the Earth's magnetic fields. One approach to the removal of the natural magnetic noise is that of monitoring the fluctuations at a moving airborne system. This requires two assumptions: the magnetic field of variations are coherent over the range on which cancellation is accomplished, and the correlation between magnetic field effects at the two sites is not dependent on the geology at either the mobile station or the reference site. Experience with geophysical surveys indicates that coherency of the magnetic field does exist; but, also, in water depths up to several thousand feet, the magnetic field is dependent upon geology at the observation site. This leads to a requirement for a method to evaluate the effect of subsea geology on local micropulsation behavior. In the research described in this report, three general categories of subsea electrical surveys were reviewed: direct current resistivity surveys, magnetotelluric soundings, and seafloor based electromagnetic system. GRA

N85-21921# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF SLOPE STABILITY, WILMINGTON TO LINDENKOHL CANYONS, US MID-ATLANTIC MARGIN
G. Almagor, R. H. Bennett, D. N. Lambert, E. B. Forde, and L. E. Shephard 1984 24 p refs Presented at IUTAM Conf. on Soil Mech., Austin, Tex., 1 Dec. 1984 Prepared in cooperation with Geological Survey of Israel, Jerusalem, Naval Ocean Research and Development Activity, Bay St. Louis, Miss., NOAA, Miami, Fla.
(Contract DE-AC04-76DP-00789)
(DE84-012276; SAND-84-1015C; CONF-841217-1) Avail: NTIS HC A02/MF A01

The continental slope gradient in the study area averages 7 to 8(0). Many valleys, canyons, and occasionally large sediment slumped masses occur. Moderate to steep slopes (19 to 27 deg) as well as very steep to precipitous slopes (> 27 deg) are abundant and occupy about 7% of the investigated area. The surficial sediments are predominantly terrigenous silty clays of medium to high plasticity (I sub p = 10 to 35% w sub L = 30 to 70%), but contain varying quantities of sands. Angles of internal friction are anti phi sub d = 27 to 32 deg, anti phi sub cu = 30 to 33 deg, and phi sub cu = 14 to 17 deg. The sediments are normally to slightly overconsolidated, but some unconsolidated sediments also were identified. DOE

N85-21922# California Univ., Los Angeles. Inst. for Marine and Coastal Studies.
USC (UNIVERSITY OF SOUTHERN CALIFORNIA) SEA GRANT PROGRAM DIRECTORY, 1984-1985
Karen Charest, ed. Oct. 1984 22 p
(Grant NA-81AA-D-00094)
(PB85-135051; USCSG-SR-04-84) Avail: NTIS HC A02/MF A01 CSCL 05I

Topics covered include: coastal planning, environmental quality, living marine resources, non-living marine resources, seaports and marine transportation, and advisory services and education. B.G.

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-21923*# Pennsylvania State Univ., University Park. Dept. of Biochemistry, Microbiology, Molecular and Cell Biology.
PURIFICATION AND CULTIVATION OF HUMAN PITUITARY GROWTH HORMONE SECRETING CELLS Final Progress Report, 1978 - 1984
W. C. Hymer 1 Aug. 1984 26 p refs
(Contract NAS9-15566)
(NASA-CR-171846; NAS 1.26:171846) Avail: NTIS HC A03/MF A01 CSCL 06C

A multiphase study was conducted to examine the properties of growth hormone cells. Topics investigated included: (1) to determine if growth hormone (GH) cells contained within the rat pituitary gland can be separated from the other hormone producing cell types by continuous flow electrophoresis (CFE); (2) to determine what role, if any, gravity plays in the electrophoretic separation of GH cells; (3) to compare in vitro GH release from rat pituitary cells previously exposed to microgravity conditions vs release from cells not exposed to microgravity; (4) to determine if the frequency of different hormone producing pituitary cell types contained in cell suspensions can be quantitated by flow cytometry; and (5) to determine if GH contained within the human post mortem pituitary gland can be purified by CFE. Specific experimental procedures and results are included. G.L.C.

N85-21924*# Phytoresource Research, Inc., College Station, Tex.
MODULAR PLANT CULTURE SYSTEMS FOR LIFE SUPPORT FUNCTIONS Final Report
1 Mar. 1985 35 p refs
(Contract NAS9-16671)
(NASA-CR-171853; NAS 1.26:171853) Avail: NTIS HC A03/MF A01 CSCL 06K

The current state of knowledge with regard to culture of higher plants in the zero-G environment is assessed; and concepts for the empirical development of small plant growth chambers for the production of salad type vegetables on space shuttle or space station are evaluated. American and Soviet space flight experiences in gravitational biology are summarized. A.R.H.

N85-21925*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESEARCH AND TECHNOLOGY ACTIVITIES AT AMES RESEARCH CENTER'S BIOMEDICAL RESEARCH DIVISION
Norman Martello (Johnson Engineering) Feb. 1985 154 p refs
(NASA-TM-86692; A-85144; NAS 1.15:86692) Avail: NTIS HC A08/MF A01 CSCL 06B

Various research and technology activities at Ames Research Center's Biomedical Research Division are described. Contributions to the Space Administration's goals in the life sciences include descriptions of research in operational medicine, cardiovascular deconditioning, motion sickness, bone alterations, muscle atrophy, fluid and electrolyte changes, radiation effects and protection, behavior and performance, gravitational biology, and life sciences flight experiments. Author

N85-21926*# Scripps Institution of Oceanography, La Jolla, Calif. Inst. of Marine Resources.
MICROPLANKTON SPECIES ASSEMBLAGES AT THE SCRIPPS PIER FROM MARCH TO NOVEMBER 1983 DURING THE 1982-1984 EL NINO EVENT
Freda M. H. Reid, Carina B. Lange (Museo Argentino de Ciencias

Naturales), and Martha M. White [1984] 29 p refs
(Grant NAGw-458)
(NASA-CR-175553; NAS 1.26:175553) Avail: NTIS HC A03/MF A01 CSCL 08A

A semiweekly sampling program at the Scripps Institution of Oceanography pier was begun in 1983 during an El Nino event. Microplankton data for March to November 1983 show a temporal sequence of species assemblages of the 24 important taxa, with a residence time of 1 to 4 weeks. From March to early September, the assemblages consisted of typical neritic taxa. From mid-September to mid-November, the presence of oceanic warm-wave species was associated with positive temperature anomalies characteristic of the El Nino condition. During the period studied numerical abundances were low. Author

N85-21927# Calspan Advanced Technology Center, Buffalo, N.Y. Dept. of Oral Biology.
INVESTIGATION OF THE INITIAL EVENTS IN BIOFOULING Final Report
A. E. Meyer, M. S. Fornalik, R. E. Baier, J. J. Zambon, and P. S. Huber 26 Nov. 1984 210 p Prepared in cooperation with State Univ. of New York at Buffalo
(Contract N00014-81-C-0671)
(AD-A149995; CALSPAN-6962-M-1) Avail: NTIS HC A10/MF A01 CSCL 06/13

The overall goals of this program include: (1) development and certification of methods for the in situ analysis of primary conditioning films and for the in situ speciation of the earliest attached microorganisms; and (2) correlation of biofilm properties with hydrodynamic factors and original substrata properties. In the study of in situ speciation of marine bacteria, specific organisms were isolated, cultured, and identified from primary microbial fouling layers and were used to generate immunofluorescent stains. The reagents were shown to be useful for specimens retrieved from controlled laboratory fouling tests and for specimens exposed to natural flowing waters of the Atlantic Ocean. Other experiments addressed the relationship between the original material substratum surface properties and mechanical/fluidic forces necessary to realize practical field benefits from the biofouling minimum (in the surface energy scale) already identified. These data are being correlated with natural fouling-resistant, low-drag surfaces such as those of living porpoises and killer whales. Preliminary data suggest the prospect of developing tethered interfacial films that will provide protection from drag-enhancing surface deposits and, possibly, give true drag reduction at no logistical penalty. GRA

N85-21928# Duke Univ., Durham, N. C. Dept. of Biochemistry.
TOXICITY, MUTAGENESIS AND AGING DUE TO ENDOGENOUS OXYGEN RADICALS Final Report, 1 Dec. 1981 - 30 Nov. 1984
Irwin Fridovich 21 Dec. 1984 13 p
(Contract DAAG29-82-K-0020)
(AD-A150121; ARO-18529.29-LS) Avail: NTIS HC A02/MF A01 CSCL 06/20

We have been examining the oxidation of ammonia to nitrite by oxygen radicals generated by the xanthine oxidase reaction. This oxidation (NH3-yields-NO2(-)), which can easily be demonstrated, is inhibited by superoxide dismutase, or by catalase, or by scavengers of the hydroxyl radical. We conclude that the iron-catalyzed reduction of H2O2 to OH(-) + OH by O2(-) is involved and that OH is the first oxidant of NH3. When NH3 is replaced by NH2OH we see NO2(-) production which is inhibited by superoxide dismutase but not by catalase. In this case we conclude that O2(-), per se, can oxidize NH2OH to NO2(-). We have been reinvestigating the killing of E. coli by paraquat. Our earlier studies showed that the lethality of paraquat was dependent upon O2 and an electron source and was decreased by elevated intracellular levels of superoxide dismutase. All of this, plus measurements of cyanide-resistant respiration, showed that O2 was essential for expression of the lethality of paraquat. This work was done in a nutrient broth medium. We now see that paraquat is much more lethal in the nutrient broth than it is in a simpler Vogel/Bonner medium. GRA

N85-21929# Skidaway Inst. of Oceanography, Savannah, Ga.
BIOLOGICAL PROCESSES IN THE WATER COLUMN OF THE SOUTH ATLANTIC BIGHT. VOLUME 1: PUBLISHED MANUSCRIPTS Progress Report, Jun. 1982 - Jun. 1985
Gustav-Adolf Paffenhofer and James A. Yoder 14 Dec. 1984 19 p
(Contract DE-AS09-76EV-00936)
(DE85-004610; DOE/EV-00936/1-Vol-1) Avail: NTIS HC A02/MF A01

Effects of the Gulf Stream on the outer southeastern US continental shelf were determined. The relationships of phytoplankton productivity and related processes to the oceanography of the inner shelf were investigated. Upwelling studies on the northeastern Florida shelf are described, and feeding and excretory rates of juvenile and adult zooplankton characteristic of advanced and matured upwellings on the southeastern continental shelf are reported. DOE

N85-21930# Health Effects Research Lab., Research Triangle Park, N. C.
BIOLOGICAL EFFECTS ON RADIOFREQUENCY RADIATION
D. F. Cahill and J. A. Elder Sep. 1984 271 p refs
(PB85-120848; EPA-600/8-83-026F) Avail: NTIS HC A12/MF A01 CSCL 06R

A critical review of the available literature on the biological effects of radiofrequency (RF) radiation is given. The objective was to summarize and evaluate the existing database for use in developing RF-radiation exposure guidance for the general public. The frequency range of concern is 0.5 MHz to 100 GHz, which includes nearly all the significant sources of population exposure to RF radiation, except 60 Hz electrical power systems. Research reports that are judged to be credible according to a set of objective criteria are examined for the relation between the RF energy absorbed and the presence or absence of biological effects. The reported consequences of the interaction between RF radiation and biological systems are examined from two perspectives: whole-body-averaged specific absorption rate and RF-energy-induced core-temperature increases. GRA

N85-21931# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 18, NO. 6, NOVEMBER - DECEMBER 1984
21 Feb. 1985 159 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984
(JPRS-USB-85-002) Avail: NTIS HC A08

Wide ranging research in the fields of aerospace medicine and bioastronautics were conducted. Test data were taken from humans in space flight and simulated spaceflight conditions as well as laboratory animals. Major concerns were the biological and physiological effects of spaceflight, both long and short term, on humans. For individual titles, see N85-21932 through N85-21958.

N85-21932# Joint Publications Research Service, Arlington, Va.
EXTERNAL RESPIRATION, GAS EXCHANGE AND ENERGY EXPENDITURES OF MAN IN WEIGHTLESSNESS c52
I. I. Kasyan and G. F. Makarov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 1-9 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 4-9 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Data on external respiration and energy expenditures of men exposed to zero-g for 185 days and to 1/6 g on the lunar surface as reported by Soviet and foreign authors is summarized. Also discussed are factors that may be responsible for a higher level of gas exchange processes at reduced g. Author

N85-21933# Joint Publications Research Service, Arlington, Va.
BLOOD AMINO ACIDS OF COSMONAUTS BEFORE AND AFTER 211-DAY SPACEFLIGHT c52
I. G. Popov and A. A. Latskevich *In its* USSR Rept: Space Biol.

and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 11-17 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 10-15 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The plasma content of 17 free amino acids of the Commander and Flight-Engineer of Salyut-1-Soyuz-T was examined before flight and on postflight days 1 and 7. The amino acids were measured in an automatic amino acid analyzer Hitachi KLA-3B. Both cosmonauts showed a decrease of most amino acids, particularly essential amino acids. On postflight day 7 the content of most amino acids did not yet return to the preflight level. It can therefore be concluded that the preflight diet should be supplemented with methionine and aspartic acid, and the flight and postflight diets with 7 essential amino acids plus cystine, arginine, proline and aspartic acid. Author

N85-21934# Joint Publications Research Service, Arlington, Va.
CIRCADIAN RHYTHM OF HUMAN BODY TEMPERATURE DURING SPACEFLIGHTS c52
L. Lhagwa *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 18-22 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 15-18 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The auxiliary temperature of the Mongolian Salyut-6 crewmember was measured in the daytime before, during and after flight. The temperature was recorded immediately after awakening to going to sleep every 2 hours: a month prelaunch in the Cosmonauts' Training Center during 5 days, a week prelaunch at the Baikonur launch site during 3 days, inflight from the middle of mission day 2 to the middle of mission day 7 every day, and postflight at Baikonur during 4 days. It was found that inflight the auxiliary temperature decreased significantly by 0.44 C as compared to the data obtained in the Cosmonauts' Training Center and by 0.22 C as compared to the data obtained at the launch site. There were also some changes in the pattern of acrophases on the time scale. It is recommended to continue thermal regulation measurements in space flight. Author

N85-21935# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL STATUS OF ADRENOCORTICAL DYSFUNCTION FOLLOWING SPACEFLIGHT c52
R. A. Tigranyan, L. I. Voronin, and N. F. Kalita *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 23-27 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec.. 1984 p 18-22 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Renal excretion of 17-HOCS and aldosterone as well as the ratio of excreted glucocorticoids and their precursors was investigated in the Soyuz-31 Commander before and after his 7-day flight. Renal excretion of total 17-HOCS remained unchanged while hydroxylation in positions 11 and 17 in the course of corticosteroid synthesis was relatively deficient. Author

N85-21936# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANALYSIS OF EFFECTS OF WEIGHTLESSNESS AND ITS MODELS ON VELOCITY AND STRENGTH PROPERTIES AND TONE OF HUMAN SKELETAL MUSCLES c52
I. R. Kozlovskaya, L. S. Grigoryeva, and G. I. Gevlich *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 28-33 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 22-26 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The effect of various types of support elimination (actual zero-g, water immersion and head-down tilt) on the strength-velocity properties and tone of leg muscles was investigated. With all the exposures used, there was a high correlation between the tone decrease and the strength potential of antigravitational muscles, as well as the degree of support elimination (immersion and bed rest). This suggests that the tonic changes associated with the decrease of the support in input are the major factor responsible for motor disorders during short-term exposures to zero-g. Author

N85-21937# Joint Publications Research Service, Arlington, Va.
COSMONAUTS' BLOOD PLASMA FREE AMINO ACID LEVELS DURING PREFLIGHT TRAINING c52
T. F. Vlasova, Ye. B. Miroshnikova, I. N. Belozerova, and A. S. Ushakov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 34-37 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Oct. 1984 p 26-28 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Taking into consideration metabolic specificities of cosmonauts, the data on their amino acid composition during preflight training were summarized. Seasonal variations produced no effect on the content of free amino acids of plasma. The analysis yielded a physiological norm for this population which can be used to identify more reliably changes in the amino acid composition of plasma after space flight. Author

N85-21938# Joint Publications Research Service, Arlington, Va.
LBNP TRAINING OF CREW MEMBERS ON MAIN MISSIONS ABOARD SALYUT-6 ORBITAL STATION c53
V. M. Mikhaylov, Yu. D. Pometov, and V. A. Andretsov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 38-44 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 29-33 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The protcols of LBNP training of five prime crews that flew onboard Salyut-6 are described. LBNP is one of the major constituents of countermeasures that must be performed inflight. LBNP may help adapt to weightlessness-induced blood redistribution and predict the level of postflight orthostatic tolerance. Author

N85-21939# Joint Publications Research Service, Arlington, Va.
MAIN COMPONENT METHOD USED TO STUDY VARIATIONS OF CARDIOVASCULAR PARAMETERS c52
A. D. Voskresenskiy, N. I. Vikhrov, A. P. Varnashenko, V. G. Doroshev, Z. A. Kirillova, M. A. Matrosova, and S. L. Chekanova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 45-50 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 33-37 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The main component method was used to analyze measurements of cardiovascular parameters taken in 14 healthy operators at rest. Each observation was characterized by the deviation of heart rate, mean blood pressure and stroke volume from individual data points. The latter were individual mean values of the above parameters recorded during the Valsalva maneuver. The first two main components were responsible for over 77% of total variance of signs. Visual analysis of observation distribution with respect to the components revealed small group and single data points situated peripherally at a distance from the major constellation of data points. Two thirds of data points in the stressed groups are associated with the subjects who show a weak reaction to the Valsalva maneuver and one third corresponds to the true stressed state. Taking into account the Valsalva maneuver, the deviations from individual data points can be used to identify the stressed state of the cardiovascular system in healthy men at rest. Author

N85-21940# Joint Publications Research Service, Arlington, Va.
ROLE OF MENTAL WORK IN HUMAN TOLERANCE IN TOTAL-BODY VIBRATION c53
Yu. N. Kamenskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002)

21 Feb. 1985 p 51-54 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 37-40 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The connection between mental work and human reaction to vibration was investigated. Phasic changes of psychophysiological parameters developed in response to vibration of 10 Hz and acceleration of 1 m/s squared for 1 h. All psychophysiological parameters significantly decreased. Circulation parameters tended to decline during exposure. The psychophysiological changes were less expressed in the test subjects normally involved in mental work. It is suggested that workers who perform mental work have a higher tolerance to vibration effects. E.A.K.

N85-21941# Joint Publications Research Service, Arlington, Va.
HUMAN LUNG FLUID CONTENT DURING 7-DAY HEAD-DOWN TILT **c52**
E. M. Nikolayenko, V. Ye. Katkow, S. V. Gvozdev, V. V. Chestukhin, M. I. Volkova, M. I. Berkovskaya, and T. G. Kediya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 55-60 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 40-44 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The time course variation of the water content of the lungs of seven males were examined during 7 day head down tilt. Compared to the horizontal subjects, the tilted subjects showed a significant increase in the water content from 557-19 m to 612-63 m by the seventh hour of the tilt. Later on the parameter gradually declined and on tilt day 7 almost returned to the pretest level, 567-46 m. The increase in the water content during the first hours of the exposure is attributed to the hydrostatic factors: higher pulmonary artery pressure and higher cardiac output. The increase in the water content on tilt days 3 to 7 is associated with changes in the permeability of lung capillaries, drainage function of the lymphatic system of the lungs and colloidal osmotic pressure in the perivascular space of the lungs. E.A.K.

N85-21942# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL STUDY OF MONKEYS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA
A. S. Kaplanskiy, C. N. Durnova, Z. F. Savik, G. S. Belkaniya, V. I. Popov, and D. S. Tavadyan *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 61-67 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 44-48 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The hearts of seven monkeys exposed to head down tilt at -6 deg were examined histologically, morphometrically, and gravimetrically. During head down tilt the heart weight increased due to blood pooling in the thebesian vessels which was associated with blood redistribution and accumulation in the vessels and parenchymal organs of the upper body. During 7 and 12 day head down tilt myocardiocytes of the capillary muscles of the ventricles were not enlarged, and the number of functioning capillaries in the papillary muscles diminished. E.A.K.

N85-21943# Joint Publications Research Service, Arlington, Va.
FLUID METABOLISM OF MONKEYS DURING TWO-WEEK ANTIORTHOSTATIC HYPOKINESIA
V. P. Krotov, Ya. C. Bazunova, and B. S. Kulayev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 68-75 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 48-54 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Water balance parameters were measured in hypokinetic rhesus monkeys using tritiated water. During exposure the water content decreased by 18.4%, with 11.3% lost within the first 7 days. The rate of water renovation measured with respect to H3 half life was decreased by a factor of 1.5 during the first week and increased by 10% during the second week, as compared to the pretest value. Daily water losses diminished by 30% during the first week and approached the pretest level during the second week. Three phases in the time course variations of water balance during head down tilt are indicated. E.A.K.

N85-21944# Joint Publications Research Service, Arlington, Va.
DISTINCTIVE MORPHOLOGICAL MANIFESTATIONS OF ACUTE STRESS REACTION IN ADRENAL CORTEX OF HYPOKINETIC RATS
Ye. V. Vorotnikov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 76-82 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 54-58 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Adrenal changes in response to an acute stress effect (5 h immobilization stress) were investigated in female rats exposed to hypokinesia for 3 months. The rate of delipoidization in the adrenal cortex increased in the rats exposed to an acute stress after short term hypokinesia. The process of delipoidization did not advance in the rats exposed to an acute stress in the course of prolonged hypokinesia. It is evidenced that during prolonged hypokinesia the adrenals develop the capacity to react to an additional effect without the entire complex of morphological signs typical of an acute stress reaction. The immobilization test used to assess the state of the adrenal cortex shows that it does not deteriorate even during 3 month hypokinesia. E.A.K.

N85-21945# Joint Publications Research Service, Arlington, Va.
PREVENTIVE EFFECT OF ACUTE HEAT FACTORS DURING HYPOKINESIA **c52**
V. I. Sobolevskiy and V. P. Pravosudov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 83-88 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 58-62 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Rat experiments showed that adaptation to acute thermal effects increases the functional ability of the heart and blood circulation. This results in an increased thermal tolerance and hypoxic resistance of the myocardium. The prophylactic effect of acute thermal exposures during hypokinesia is related to a significant reduction of the level of metabolic and functional changes in the heart and skeletal muscles during diminished motor activity. E.A.K.

N85-21946# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF ADAPTIVE DISTINCTIONS OF MECHANISM OF CONTROLLED GLYCEMIA IN MACACA RHESEUS MONKEYS
G. S. Belkaniya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 89-95 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 62-66 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Reactions of adult rhesus monkeys to the glucose tolerance test and the insulin sensitivity test were examined during different exposures. It was found that both tests are useful to evaluate responses to various environmental effects, psychoemotional strain, acute stress state and orthostatic effects. It is shown that orthostatics potentiates the inhibition of insulin secretion. The reciprocal relationship between glucose tolerance and insulin sensitivity was detected in the functional range of vago-insular regulation. The role of orthostatics in neurogenic disorders of the mechanism of glycemic regulation is discussed. The synergism of the combined effect of orthostatics and psychological stress is described. E.A.K.

N85-21947# Joint Publications Research Service, Arlington, Va.
MULTIPLE REGRESSION METHOD USED TO ASSESS ANIMAL ADAPTATION TO HYPOXIC HYPOXIA
V. V. Kustov, V. G. Litau, Yu. A. Kukushkin, and S. M. Razinkin *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 96-99 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 67-69 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

White mice were exposed to hypoxic hypoxia during 30 days. A correlation was established between the altitude ceiling and various physiological parameters, coefficients of adaptive oxygen consumption at 6000 m to that at sea level, and the ratio of oxygen consumption in hypoxic environment to that in a pormoxic atmosphere. It is concluded that the multiple regression method can be used for measuring objectively the tension of regulatory systems and for discriminating stages of animal adaptation to hypoxic hypoxia. E.A.K.

N85-21948# Joint Publications Research Service, Arlington, Va.
EFFECT OF HIGH AMMONIA CONTENT IN CLOSED ENVIRONMENT ON SOME PARAMETERS OF HUMAN NITROGEN AND CARBOHYDRATE METABOLISM AGAINST BACKGROUND OF A CONTROLLED DIET c52
A. K. Sivuk, L. I. Mosyakina, N. A. Malevskaya-Malevich, I. A. Ulyanova, Ye. A. Sedova, and A. N. Kravchuk *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 100-105 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 69-73 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Data on nitrogen and carbohydrate metabolism in men kept in an enclosed environment with a high ammonium content combined with a high temperature and humidity are presented. The toxic environmental effect manifests itself when the ammonium concentration increases up to 5 mg/cu m in combination with a high temperature and humidity level. During this period protein catabolism and negative nitrogen balance enhance. It is recommended that vitamins should be added to the diet used under the above conditions. E.A.K.

N85-21949# Joint Publications Research Service, Arlington, Va.
MODEL OF INFORMATION-REFERENCE DIALOGUE SYSTEM FOR WORKING WITH DOCUMENT ABSTRACTS c82
O. N. Rustamyan and V. K. Vasilyev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 106-112 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 73-76 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

Issues related to development and trial operation of a model of an information reference dialogue system (DISS) for use with files of documents that have an hierarchic structure are discussed. The purpose of the model is to obtain a simplified DISS circuit on a YeS-1033 computer in order to define user requirements as to organizing dialogues from the technical and informational points of view. The need to develop a DISS is due to the inadequate efficiency of manual processing of the increasing flow of information (abstracts of scientific research works, diverse standards related documents, information about methods of running processes, etc.) because of the expansion in volume of documents. B.W.

N85-21950# Joint Publications Research Service, Arlington, Va.
SPIROLIT-2 INSTRUMENT USED TO TEST PULMONARY VENTILATION c35
V. V. Zhuravlev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 113-115 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 76-77 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

At the present time, the Spirolit-2 automatic analyzer of main respiratory gases, of the Junkalor Dessau firm, is used to examine parameters of gas exchange, levels of energy expended by man and animals with different degrees of activity. However, the capabilities of this model of the instrument are limited. A method of determining pulmonary ventilation with use of the Spirolit-2 is described. An additional exhalation valve is built into a valve box to which an anesthesia machine rubber bag is attached. Samples are collected into another bag concurrently with the usual tests on the Spirolit-2 instrument. Four to five minutes are sufficient to obtain stable parameters at relative rest of oxygen uptake, determine carbon dioxide output per minute and collect samples in for analysis of exhaled air. The proposed method can furnish information about the dynamics of development of respiratory function of the lungs at virtually any moment with a constant physical load. For this, there must be spare bags to collect samples. Stage-by-stage data can be obtained analogously as to ventilation volume during a step test while determining maximum oxygen uptake. B.W.

N85-21951# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF CARBOHYDRATE METABOLISM AND BLOOD SERUM ENZYME ACTIVITY AFTER SHORT-TERM SPACEFLIGHTS c52
I. A. Popova, T. Ye. Drozdova, and Ye. G. Vetrova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 116-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 78-79 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The preliminary results of biochemical tests made after each spaceflight constitute a complex picture of diverse and sometimes contradictory changes in most biochemical parameters of blood and urine, as compared to preflight values. The distinctive individual reactions of cosmonauts play some part in this. The patterns of reactions to brief weightlessness were assessed from statistical data attained from visiting missions (VM) of the Salyut-6 scientific space complex. B.W.

N85-21952# Joint Publications Research Service, Arlington, Va.
RESULTS OF SANITARY-MICROBIOLOGICAL STUDIES ABOARD COSMOS-1129 BIOSATELLITES c52
V. I. Korolkov, A. N. Viktorov, L. N. Petrova, V. M. Knyazev, and K. V. Stelingovskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 119-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 79-81 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The studies conducted aboard biological satellites of the Cosmos series were oriented toward investigation of mechanisms of changes in physiological functions of experimental animals under the effect of spaceflight factors. It is important to rule out any factors affecting the quality of these experiments, including the microbial one. For this reason, studies were made of the autoflora of the integument of experimental animals (Wistar rats) and microflora of the environment aboard Cosmos-936 and Cosmos-1129 biosatellites, as well as mockups in order to obtain base data for development of special epidemic-control measure to assure the purity and accuracy of biological and physiological experiments. Information about the microbiological status of experimental animals is also necessary for a fuller evaluation of their functional state under spaceflight conditions. B.W.

N85-21953# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF QUANTITATIVE AND QUALITATIVE CHANGES IN CONDITIONALLY PATHOGENIC MICROFLORA OF THE HUMAN INTESTINE DURING LONG-TERM HYPOKINESIA c52
N. A. Polikarpov and V. M. Shilov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 123-126 refs Transl. into ENGLISH

from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 81-83 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

It is known that spaceflight conditions could lead to change in both nonspecific resistance to infection and specific immunological reactivity. They can disrupt relative equilibrium in the composition of the human microbial cenosis. Conditional enterobacteria play an important part in the etiology of infectious diseases of man. The conditionally pathogenic microflora of the human intestine under antiorthostatic (head-down tilt) and long-term hypokinetic conditions were investigated. The results of studies are submitted of quantitative and species composition of conditionally pathogenic microflora of the intestine of subjects submitted to antiorthostatic hypokinesia (AOH) for 182 days. B.W.

N85-21954# Joint Publications Research Service, Arlington, Va.
RAT TISSUE OPIOID PEPTIDE CONTENT DURING LONG-TERM HYPOKINESIA
R. A. Tigranyan and O. P. Vakulina *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 127-131 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 83-85 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

A conception has been formed to the effect that opioid peptides play an important part in adaptive protective changes under extreme conditions. It was shown that opioids are of substantial significance in controlling a number of physiological functions--respiration, blood pressure, endocrine and digestive system function, body temperature. On the basis of numerous data, it is postulated that there is an extensive antinociceptive system in the animal brain, the principal neurotransmitters and modulators of which are endorphins and enkephalins. When activated under stress, this endogenous analgesic system controls the level of pain sensibility, modulates emotional, behavioral and hemodynamic components of stressor effects. It is known that hypokinesia, which is one of the extreme factors of spaceflights, leads to marked changes in neurohumoral regulation of many body functions. The levels of enkephalins and beta-endorphins in blood, parts of the brain and adrenals during hypokinesia of different duration (up to 60 days) and in the recovery period after 60-day hypokinesia were studied. B.W.

N85-21955# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM REPEATED EXPOSURE TO HIGH-INTENSITY STATIONARY MAGNETIC FIELD ON ADRENO-MEDULLARY ACTIVITY c52
L. V. Kokoreva *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 132-135 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 86-87 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

In the last few decades there has been noticeable expansion of the area of application of magnetic units, which has led to increase in number of workers who are regularly exposed to stationary magnetic fields (SMF) of medium and even high intensity. For this reason, it is necessary to investigate the distinctions of reactions, primarily of the body's adaptive systems, to regular exposure to SMF. There are indications in the literature of change in activity of the adrenosympathetic system and some morphological changes in the adrenal medulla under the effect of SMF. The dynamics of changes in catecholamine (CA) content of blood plasma and adrenal tissue during long-term regular exposure to SMF with induction of 1.6 T were investigated. B.W.

N85-21956# Joint Publications Research Service, Arlington, Va.
EFFECT OF STATIONARY MAGNETIC FIELD ON BLEEDING TIME c52
E. Gorchinskaya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 136-139 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 87-89 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The geomagnetic field, being one of the basic physical environmental factors, determines the course and activity of physiological processes in man and animals. Modern industry generates zones of increased magnetic field intensity, in which it may be necessary for man to spend some time. The results of numerous experiments have proven that prolonged exposure to an exogenous magnetic field elicits hemostatic disturbances. The effect of a stationary magnetic field on bleeding time in guinea pigs was studied and the role of biological rhythms was assessed. B.W.

N85-21957# Joint Publications Research Service, Arlington, Va.
REVIEW OF US MANUAL OF CLINICAL AVIATION MEDICINE c52
A. A. Gyurdzhian and V. F. Tokarev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 140-145 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 89-92 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

The most frequent diseases of flight personnel that the aviation physician encounters are discussed. The effect of these diseases on flight work is investigated. The physician's tactics with regard to treatment and permission to fly in the light of the latest medical advances are reviewed. Data are submitted on diseases specific to flight personnel and course of different diseases in aviators as related to the distinctions of their work. There is a special place for questions of effects of different drugs and therapeutic methods on flight work. Appropriate recommendations are offered in each case. A brief history of clinical aviation medicine is given. B.W.

N85-21958# Joint Publications Research Service, Arlington, Va.
REVIEW OF US GUIDE ON MEDICATION AND FLYING c52
E. M. Panova and V. F. Tokarev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 146-148 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 92-93 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

This guide is one of the first on pharmacotherapy for flight personnel and aviation physicians. Recommendations on questions of safety of intake of various drugs by pilots are provided. Basic information about more than 200 drugs that are either dispensed by prescription or without it is provided. The agents are classified according to their effects on inflight performance. The book lists agents (giving generic and patented names), describes the marked side-effects of each of them, lists indications for intake of agents and time required for their elimination. B.W.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-21959* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 267, JANUARY 1985
Jan. 1985 323 p
(NASA-SP-7011(267); NAS 1.21:7011(267)) Avail: NTIS HC $12.00 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 255 through 266 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes--

subject, personal author, corporate source, foreign technology, contract number, report number, and accession number. Author

N85-21960# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
SOME INDIVIDUAL DIFFERENCES IN HUMAN RESPONSE TO INFRASOUND
D. S. Nussbaum and S. Reinis Jan. 1985 69 p refs
(UTIAS-282; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

A review of literature describing the effects of very low frequency sound on humans revealed a controversy between authors claiming that infrasound is very harmful to humans and those claiming that infrasound cannot engender any subjective or objective symptoms. It is shown that these discrepancies may be explained by individual variability in response to low frequency sound. An experiment was performed to determine whether some individuals are uniquely sensitive to infrasound. Three acoustic conditions were employed. These consisted of a control (amplifier hum) condition and two 8 Hz infrasound conditions: a high distortion signal and a low distortion signal. Subjects were grouped by their subjective responses. No control subjects exposed to amplifier hum reported any adverse responses. The distribution of symptoms (headache and fatigue vs dizziness and nausea) between the high and low distortion groups was significantly different. In persons reporting symptoms, the higher level of harmonics was primarily associated with headache and fatigue, while reduction of harmonics primarily resulted in diziness and nausea. B.W.

N85-21961# Little (Arthur D.), Inc., Cambridge, Mass.
DETERMINATION OF TOXICITY OF COMBUSTION PRODUCTS OF HABITABILITY FOAMS CONCURRENTLY WITH FLAMMABILITY STUDIES OF THESE MATERIALS Final Report
Jun. 1984 71 p
(Contract N00167-84-C-0018)
(AD-A149647; DTNSRDC/SME-CR-19-84) Avail: NTIS HC A04/MF A01 CSCL 06/20

A method for the quantitative evaluation of fire behavior including toxicity in a single apparatus was developed and subjected to preliminary evaluation. Using four test materials identified by the U.S. Navy, conditions of decomposition process were varied by changing the heat flux (20 kW/sq m and 80 kW/sq m), sample area, sample material, fire ventilation and total dilution of fire products . Toxicity was measured by bioassay using death as the animal response. Toxicity data were compared to test data obtained in the University of Pittsburgh test apparatus. Several possible indicators of toxicity were identified. These were fuel vapor concentration, dilution factor and concentration of pyrolyzate and CO. These might prove useful in material comparisons as well as in fire modeling developed for hazard evaluation. Order at relative potency for the four test materials was similar for each ranking system examined. Author (GRA)

N85-21962# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
THE MEDICAL RESULTS OF HUMAN EXPOSURES TO RADIO FREQUENCY RADIATION Summary Report
R. B. Graham Dec. 1984 21 p
(AD-A149718; OEHL-85-029CV111ARA) Avail: NTIS HC A02/MF A01 CSCL 06/5

This report is a summary of the USAF Air Force experience in the realm of accidental overexposures to radiofrequency radiation (RFR). It contains a brief history of the Air Force RFR protection program, some examples of accidents that have occurred, and an overview of the medical implications of those overexposures as we understand them today. GRA

N85-21963# School of Aerospace Medicine, Brooks AFB, Tex.
SECOND GENERATION USAFSAM (UNITED STATES AIR FORCE SCHOOL OF AEROSPACE MEDICINE) MICROPROCESSOR AUDIOMETER Final Report, 1 Oct. 1982 - 30 Jun. 1984
H. C. Sutherland, Jr. and R. Danford, Jr. Nov. 1984 13 p
(DA Proj. 775-5)
(AD-A149938; USAFSAM-TR-84-40) Avail: NTIS HC A02/MF A01 CSCL 06/5

Pure-tone air conduction thresholds obtained with the USAF School of Aerospace Medicine second generation microprocessor audiometer (MPA) were compared to those obtained using conventional manual audiometric technique. The MPA results are considered a suitable substitute for manual testing even though small significant differences did appear. The MPA was able to accept preliminary information including reference hearing levels from a keyboard or magnetic strip card, to calculate threshold shift and its significance, print a hard copy of results, store results on a magnetic strip card, and store results on magnetic tape in a cassette for transmittal to a central registry. Several troublesome malfunctions occurred that seemed to be inherent in fabricating dedicated hardware. Conclusions are that MPA audiometry could be of great value in a hearing conservation program, but it now appears that using off-the-shelf hardware would be a better approach than manufacturing dedicated equipment. GRA

N85-21964# State Univ. of New York, Buffalo. Dept. of Physiology.
HIGH PRESSURE ENVIRONMENTAL CONDITIONING SYSTEMS AND CHAMBER REHABILITATION Final Report, 1 Nov. 1975 - 1 Mar. 1983
H. Rahn and C. Lundgren 15 Nov. 1984 23 p
(Contract N00014-76-C-0472)
(AD-A150039) Avail: NTIS HC A02/MF A01 CSCL 06/19

The physiological research performed under the Contract ranged from cellular function and membrane function to the performance of whole organisms under conditions relevant to the diver's situation. A study of ionic currents in the voltage-clamped squid axon exposed to helium pressures of up to 204 atmospheres has been performed. One study addressed the effects of pressure perse on sodium transport and ATPase activity in human erythrocytes. A major area of research initiated under this Contract is related to the effects of hydrostatic pressure differences on the chest and lungs of a diver. Several studies addressed pulmonary gas exchange related to gas-phase diffusivity and gas flow resistance. High Pressure Environmental Conditioning Systems and Chamber Rehabilitation were also studied. GRA

N85-21965# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
A STUDY OF LOW-LEVEL LASER RETINAL DAMAGE Annual Progress Report, 1 Jan. - 31 Dec. 1984
B. F. Hochheimer 15 Jan. 1985 78 p
(Contract N00024-83-C-5301)
(AD-A150046; JHU/APL/RC-RCS-044) Avail: NTIS HC A05/MF A01 CSCL 06/18

The general objective of this program is to determine the retinal reflectivity of the retina. The diffuse retinal reflectivity of 25 animals has been measured from a wide variety of species. An artificial eye, with a Kodak White Reflectance Standard as an artificial retina, is used as a reference. The artificial eye has a focal length of 25 mm. This white surface has known reflectance characteristics, almost 100%, and is claimed to be perfectly diffuse. The energy from the animal retina is divided by the energy from the artificial retina (at the same wavelength) to remove spectral variation in light level, instrument transmission, and detector sensitivity. GRA

N85-21966# Oak Ridge National Lab., Tenn. Biology Div.
CHEMICAL CHARACTERIZATION AND TOXICOLOGIC EVALUATION OF AIRBORNE MIXTURES. INHALATION TOXICOLOGY OF DIESEL FUEL OBSCURANT AEROSOL IN SPRAGUE-DAWLEY RATS. PHASE 3. SUBCHRONIC EXPOSURES Final Report, 1979 - 1983
Simon Lock, Walden Dalbey, Richard Schmoyer, and Richard Griesemer May 1984 85 p Sponsored in part by Army Medical Research and Development Command
(AD-A150100; ORNL/TM-9403) Avail: NTIS HC A05/MF A01 CSCL 06/20

Inhalation exposures were performed twice per week, for 13 weeks, to determine whether there was any potential toxicity

to rats of comparatively low concentrations of a condensation aerosol from diesel fuel. Animals were divided into 4 groups (24 per sex in each group) and exposed to aerosol concentrations of 0, 0.25, 0.75 and 1.50 mg diesel fuel aerosol/L for 4 hours per day. A fifth group (12 per sex) was used as vivarium controls. Body weight and food consumption were measured weekly for duration of the exposure and also during a two month recovery period. Changes in breathing frequency and the response of animals to a loud sharp sound (startle response) were measured in selected animals prior to the start of the exposures, at various time points during the thirteen week expcsure period, and at monthly intervals during the recovery period. Assays were performed on selected animals at the end of the exposure period, and again after the two month recovery period. Endpoints included pulmonary function tests, numbers of alveolar free cells, clinical chemistry, hematology, organ weights and histopathology. No mortalities were recorded during the exposure or recovery periods. GRA

N85-21967# Northeastern Univ., Boston, Mass. Dept. of Electrical Engineering.
APPLICATION OF THE SYSTEM IDENTIFICATION TECHNIQUE TO GOAL-DIRECTED SACCADES Final Report, 1 Jun. 1983 - 31 May 1984
John Denis Enderle 30 Jul. 1984 95 p
(Grant AF-AFOSR-0187-83)
(AD-A150132; AFOSR-84-1212TR) Avail: NTIS HC A05/MF A01 CSCL 06/16

Saccadic eye movements are among the fastest voluntary muscle movements the human body is capable of producing and are characterized by a rapid shift of gaze from one point of fixation to another. Although the purpose for such an eye movement is obvious (that is, to quickly redirect the eyeball to the target), the neuronal control strategy is not. The present investigation utilizes system identification techniques to estimate muscle forces during horizontal saccadic eye movements in order to better understand the neuronal control strategy. The lateral and medial rectus muscle of each eye was modeled as a parallel combination of an active state tension generator with a viscosity and elastic element, connected to a series elastic element. The eyeball was modeled as a sphere connected to a viscosity and elastic element. The predictions of the model were shown to be in good agreement with the data. The results of extensive analysis did not support the existence of a postulated continuous-time external feedback control mechanism. Analysis of the data, however, did support a time optimal control strategy, a strategy which directs the eyeball to its destination in minimum time for saccades of all sizes. GRA

N85-21968# Research Inst. of National Defence, Stockholm (Sweden). Human Studies Dept.
BIOLOGICAL EFFECTS OF BLAST AND IMPACT WAVES
Birger Schantz Sep. 1984 79 p refs In SWEDISH; ENGLISH summary Proc. of Res. Meeting, 3-4 Jan. 1984
(FOA-C-52006-H4-D7; ISSN-0347-7665) Avail: NTIS HC A05/MF A01

Blast wave and impact physics, and effects on exposed tissues and organs are discussed. Lungs, central nervous, and gastrointestinal systems; and effect of impact waves on isolated cell structures were studied. Results of an experimental study on pigs exposed to blast waves from different sources are reported and the causes of death are analyzed. Author (ESA)

N85-21969# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE CLINICAL AND BIOMEDICAL EVALUATION OF TRAUMA AND FATALITIES ASSOCIATED WITH AIRCREW EJECTION AND CRASH. A WORKING GROUP REPORT
D. J. Anton, ed. (Royal Air Force, Farnborough, England) Loughton, England Dec. 1984 79 p refs
(AGARD-AR-194; ISBN-92-835-1483-1) Avail: NTIS HC A05/MF A01

Topics covered include aerospace medicine, aircraft ejection and crash, head and neck injuries, radiological assessment of cervical injury; post mortem procedures; and clinical and biological evaluations of trauma and fatalities. For individual titles, see N85-21970 through N85-21977.

N85-21970# Royal Air Force, London (England).
INTRODUCTION: THE CLINICAL AND BIOMEDICAL EVALUATION FOR TRAUMA AND FATALITIES ASSOCIATED WITH AIRCREW EJECTION AND CRASH
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 1-2 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

Existing records suffer from major sources of error that make them unreliable for the generation of useful statistical ejection injury information. There is little reliable evidence to suggest that head and neck injury is a significant hazard of within envelope ejections on modern escape systems. Some evidence exists to suggest that failure to ensure adequate man/seat separation and optimal parachute alignment is responsible for a significant proportion of the severe and fatal injuries that have occurred. A prospective study on two areas was suggested: protocols on clinical and radiological information and post mortem procedures. B.G.

N85-21971# French Air Force, Paris.
STATISTICS OF FRENCH ARMEE DE L'AIR EJECTIONS 1970 - 1980
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 3-5 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

A statistical analysis of aircraft ejections classified by airspeed and altitude is presented. Fatalities are listed by aircraft type, flight status, altitude, airspeed, helmet status, and sequence of ejection. B.G.

N85-21972# German Air Force, Fuerstenfeldbruk (West Germany).
LIST OF HEAD/NECK INJURY ON EJECTION IN THE GERMAN ARMED FORCES FROM 1972-1981
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 6-10 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

Injuries and fatalities are listed according to date, aircraft type, ejection seat type, handle (upper/lower), head/neck injuries, other injuries, and injury cause. The two fatalities are discussed in detail to understand the mechanisms involved. B.G.

N85-21973# Department of the Navy, Washington, D. C.
A REVIEW OF NECK INJURY AND IMPAIRED CONSCIOUSNESS ASSOCIATED WITH US NAVY EJECTIONS 1 JANUARY 1969 - 31 DECEMBER 1979
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 11-16 (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

Over the past decade major attention was focused on developing information concerning the casual mechanisms of injuries reported sustained by ejectees. Of particular interest was injury to the head, neck, and cervical spine. Injury to either of these parts and the resulting impairment of physical function and/or consciousness can sometimes result in death directly or contribute to a fatal outcome as result of the ejectee's inability to assist in his survival. In order to establish the scope of the problem, US Navy ejection data covering the period 1 January 1969 through 31 December 1979 were reviewed. Author

N85-21974# Department of the Air Force, Washington, D.C.
A REVIEW OF FATALITY, IMPAIRMENT OF CONSCIOUSNESS, AND HEAD/NECK INJURY ON USAF EJECTIONS 1971 - JULY

1983
In AGARD Rept. of the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 17-21 (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

With the increasing speed of USAF high performance aircraft (HPA) and the ever more complex maneuvering environment, a great deal of attention is now being paid to the improvement of escape systems. Of special interest was injury to the head, neck and cervical spine. Nine hundred and fifty ejections from USAF aircraft that occurred during the period 1 January 1971 to mid-July 1983 are reviewed. The purpose is to present the USAF data in a form similar to that presented by the Royal Air Force (RAF) in AEG Report No. 476. Author

N85-21975# Royal Air Force, London (England).
A REVIEW OF FATALITY, IMPAIRMENT OF CONSCIOUSNESS AND HEAD AND NECK INJURY ON ROYAL AIR FORCE EJECTIONS 1968-1981
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 22-33 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

With the increasing refinement of escape systems, heightened attention was paid to the problems of incapacitation and head and neck injury on ejection. Two hundred and thirty seven peacetime, voluntarily initiated, ejections on Martin Baker escape systems, that occurred during the period 1 January 1968 to 31 December 1981 are reviewed. All ejections proceeded to full parachute deployment. Eight fatalities occurred; seven over water and one over land. Six cases of impairment of consciousness were reported and three cases of neck injury. Author

N85-21976# French Air Force, Paris.
THE CLINICAL AND RADIOLOGICAL ASSESSMENT OF CERVICAL INJURY, ANNEX A
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 34-66 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

The cervical spine is the most mobile portion of the spine. During trauma, this mobility is compounded by inertia forces at the skull and the presence of the spinal cord, which is less well protected here than in other portions of the spine. Injuries following ejection would seem to be unusual, but when they do occur may take a variety of forms: fracture dislocations, dislocations, severe strains. If these lesions are unstable, dramatic neurological complications may occur immediately or after some delay. The task of identifying factors of instability of a cervical lesion falls to the radiological examination. It should be recalled that radiological exploration of the whole spine, segment by segment, of any survivors is obligatory in the Armee de l'Air Francaise (French Air Force), following ejection or any accident involving the flight deck. The radiological examination of the cervical spine is difficult; it is based on the findings of the clinical examination of the subject and the plates are difficult to interpret. The initial radiological methods and incidences used (routine plates, tomograms and sometimes dynamic radiography) are considered. The more demanding secondary examinations, such as the scanner, myelogram or angiogram are not discussed. Author

N85-21977# German Air Force, Fuerstenfeldbruk (West Germany).
HEAD/NECK INJURY: POST MORTEM PROCEDURES, ANNEX B
In AGARD Rept. on the Working Group on the Clinical and Biomedical Evaluation of Trauma and Fatalities Associated with Aircrew Ejection and Crash Dec. 1984 p 67-68 refs (For primary document see N85-21969 12-52)
Avail: NTIS HC A05/MF A01

Post mortem procedures discussed include: (1) field investigation after fatal ejection; (2) autopsy; and (3) histological examination. B.G.

N85-21932# Joint Publications Research Service, Arlington, Va.
EXTERNAL RESPIRATION, GAS EXCHANGE AND ENERGY EXPENDITURES OF MAN IN WEIGHTLESSNESS
I. I. Kasyan and G. F. Makarov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 1-9 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 4-9 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21933# Joint Publications Research Service, Arlington, Va.
BLOOD AMINO ACIDS OF COSMONAUTS BEFORE AND AFTER 211-DAY SPACEFLIGHT
I. G. Popov and A. A. Latskevich *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 11-17 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 10-15 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21934# Joint Publications Research Service, Arlington, Va.
CIRCADIAN RHYTHM OF HUMAN BODY TEMPERATURE DURING SPACEFLIGHTS
L. Lhagwa *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 18-22 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 15-18 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21935# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL STATUS OF ADRENOCORTICAL DYSFUNCTION FOLLOWING SPACEFLIGHT
R. A. Tigranyan, L. I. Voronin, and N. F. Kalita *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 23-27 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec.. 1984 p 18-22 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21936# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANALYSIS OF EFFECTS OF WEIGHTLESSNESS AND ITS MODELS ON VELOCITY AND STRENGTH PROPERTIES AND TONE OF HUMAN SKELETAL MUSCLES
I. R. Kozlovskaya, L. S. Grigoryeva, and G. I. Gevlich *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 28-33 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 22-26 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21937# Joint Publications Research Service, Arlington, Va.
COSMONAUTS' BLOOD PLASMA FREE AMINO ACID LEVELS DURING PREFLIGHT TRAINING
T. F. Vlasova, Ye. B. Miroshnikova, I. N. Belozerova, and A. S. Ushakov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 34-37 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Oct. 1984 p 26-28 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21939# Joint Publications Research Service, Arlington, Va.
MAIN COMPONENT METHOD USED TO STUDY VARIATIONS OF CARDIOVASCULAR PARAMETERS
A. D. Voskresenskiy, N. I. Vikhrov, A. P. Varnashenko, V. G. Doroshev, Z. A. Kirillova, M. A. Matrosova, and S. L. Chekanova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p

45-50 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 33-37 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21941# Joint Publications Research Service, Arlington, Va.
HUMAN LUNG FLUID CONTENT DURING 7-DAY HEAD-DOWN TILT
E. M. Nikolayenko, V. Ye. Katkow, S. V. Gvozdev, V. V. Chestukhin, M. I. Volkova, M. I. Berkovskaya, and T. G. Kediya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 55-60 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 40-44 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21945# Joint Publications Research Service, Arlington, Va.
PREVENTIVE EFFECT OF ACUTE HEAT FACTORS DURING HYPOKINESIA
V. I. Sobolevskiy and V. P. Pravosudov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 83-88 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 58-62 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21948# Joint Publications Research Service, Arlington, Va.
EFFECT OF HIGH AMMONIA CONTENT IN CLOSED ENVIRONMENT ON SOME PARAMETERS OF HUMAN NITROGEN AND CARBOHYDRATE METABOLISM AGAINST BACKGROUND OF A CONTROLLED DIET
A. K. Sivuk, L. I. Mosyakina, N. A. Malevskaya-Malevich, I. A. Ulyanova, Ye. A. Sedova, and A. N. Kravchuk *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 100-105 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 69-73 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21951# Joint Publications Research Service, Arlington, Va.
PARAMETERS OF CARBOHYDRATE METABOLISM AND BLOOD SERUM ENZYME ACTIVITY AFTER SHORT-TERM SPACEFLIGHTS
I. A. Popova, T. Ye. Drozdova, and Ye. G. Vetrova *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 116-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 78-79 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21952# Joint Publications Research Service, Arlington, Va.
RESULTS OF SANITARY-MICROBIOLOGICAL STUDIES ABOARD COSMOS-1129 BIOSATELLITES
V. I. Korolkov, A. N. Viktorov, L. N. Petrova, V. M. Knyazev, and K. V. Stelingovskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 119-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 79-81 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21953# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF QUANTITATIVE AND QUALITATIVE CHANGES IN CONDITIONALLY PATHOGENIC MICROFLORA OF THE HUMAN INTESTINE DURING LONG-TERM HYPOKINESIA
N. A. Polikarpov and V. M. Shilov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 123-126 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 81-83 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21955# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM REPEATED EXPOSURE TO HIGH-INTENSITY STATIONARY MAGNETIC FIELD ON ADRENO-MEDULLARY ACTIVITY
L. V. Kokoreva *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 132-135 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 86-87 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21956# Joint Publications Research Service, Arlington, Va.
EFFECT OF STATIONARY MAGNETIC FIELD ON BLEEDING TIME
E. Gorchinskaya *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 136-139 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 87-89 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21957# Joint Publications Research Service, Arlington, Va.
REVIEW OF US MANUAL OF CLINICAL AVIATION MEDICINE
A. A. Gyurdzhian and V. F. Tokarev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 140-145 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 89-92 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21958# Joint Publications Research Service, Arlington, Va.
REVIEW OF US GUIDE ON MEDICATION AND FLYING
E. M. Panova and V. F. Tokarev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 146-148 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 92-93 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-21978# Advanced Research Resources Organization, Bethesda, Md.
TEAM DIMENSIONS: THEIR IDENTITY, THEIR MEASUREMENT AND THEIR RELATIONSHIPS Final Research Note
V. F. Nieva, E. A. Fleishman, and A. Rieck Jan. 1985 101 p (Contract DAHC19-78-C-0001)
(AD-A149662; ARI-RN-85-12) Avail: NTIS HC A06/MF A01 CSCL 05/10

This report represents the initial phase of a programmatic effort aimed at answering basic questions about the nature of team performance and the factors affecting it. An extensive literature review on the relationships between various team or group characteristics and collective performance was conducted, and a summary of propositions derived from this literature is presented. In addition, a new conceptualization of team performance is proposed, and a provisional taxonomy of team performance dimensions consistent with this conceptualization is presented.
GRA

N85-21979# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CHOICE REACTION TIME AND COLOR: AN ANNOTATED

BIBLIOGRAPHY Technical Report, Jan. 1983 - Jan. 1984
S. Kelly Aug. 1984 92 p
(AD-A149722; AFAMRL-TR-84-022) Avail: NTIS HC A05/MF A01 CSCL 05/10

This bibliography includes abstracts of 59 studies and review articles which are related to the effect of color coding on choice reaction time. As color displays become more widely used for information gathering and decision-making tasks, the effect of color coding on these tasks and their components will become increasingly important design considerations. Choice reaction time, the time required to make a binary choice, affects the total execution time of many decision-making and information gathering tasks, and seems to be a particularly relevant measure of effectiveness of color coding. This bibliography draws together much of the current literature, for reference by human factors researchers and systems designers. Two techniques lend themselves to measurement of choice reaction time: the Sternberg paradigm and the Within-Task Subtractive Method. GRA

N85-21980# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
HUMAN ASSEMBLY TIME VERSUS LEVELS OF VISUAL AND TACTILE SENSORY INPUT: EXPERIMENTAL RESULTS FOR FIVE DEVICES Interim Report
S. M. Miller Sep. 1984 78 p
(AD-A149982; CMU-RI-TR-84-22) Avail: NTIS HC A05/MF A01 CSCL 06/16

Results are reported of laboratory experiments where levels of visual and tactile sensory input of human subjects are controlled and time required to assemble several types of devices is measured. There is an inverse relationship between the time to assemble a device and the amount of sensory input available to the subject. The results indicate that different types of assembly tasks require different types and amounts off sensory information processing. Another result is that the impact of a change in the level of tactile sensory input on assembly time depends on the available level of visual sensory input, and the nature of the interaction between visual and tactile information varies across the different assembly tasks. An analysis of the extent to which elemental manipulative subtasks (as categorized by the Methods Time Measurement System) are affected by changes in the level of visual and tactile sensory information is presented. Results are also reported of experiments where the levels of visual input and manipulative capability of human subjects are controlled. Originator-supplied key words include: Experimental design. GRA

N85-21981# New York Academy of Sciences, N. Y.
ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, VOLUME 423
J. Gibbon and L. Allan 13 May 1984 661 p Presented at the Timing and Time Perception Conf., New York, 10-13 May 1983 (Contract N00014-84-G-0130)
(AD-A150031) Avail: NTIS HC A99/MF A01 CSCL 05/10

This volume is the result of a conference on Timing and Time Perception, held on May 10-13 1983, by the New York Academy of Sciences. Major topics include: Time Perception; Timing of Motor Programs and Temporal Patterns; Timing in Cognitive Processing and Memory; Rhythmic Patterns and Music; and The Internal Clock. GRA

N85-21982# Federal Aviation Administration, Washington, D.C. Office of Aviation Safety.
PROCEEDINGS OF THE 6TH HUMAN FACTORS WORKSHOP ON AVIATION
May 1982 229 p Proc. held in Oklahoma City, 7-9 Jul. 1981
(AD-A150043; FAA-ASF-81-8; DOT-TSC-FAA-81-21) Avail: NTIS HC A11/MF A01 CSCL 05/5

The human elements discussed must be factored into the aviation maintenance assumptions and operators programs. All too often in the past when the probable cause of an accident or incident was identified as a human error in maintenance, that was the end of it. In the next two days, we'd like to take it a step further, not necessarily by coming up with any answer or drawing any fixations on any conclusions, but to try to identify the central issues that relate to the human factor in aviation maintenance. GRA

N85-21983# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
THE ACCURACY IN CALCULATIONS OF INTERVISIBILITY WITH DIGITAL TERRAIN MODELS
Anders Wellving and Lena Eriksson Oct. 1984 37 p refs In SWEDISH; ENGLISH summary
(FOA-C-20557-D8(E1); ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Two computation models for measuring target exposure distances and line-of-sight on the battlefield were compared. One model stores elevation and forest height in a regular 50 m grid net. The other includes more details for describing the vegetation, and therefore the computation requires more time. Comparison with field surveys shows that both models have an unsatisfactory accuracy in the calculation of exposure distances, but the latter is significantly better than the former. The lines-of-sight are however calculated with acceptable accuracy in both models. The terrain was a mixture of open flat areas and hills with forest. Author (ESA)

N85-21938# Joint Publications Research Service, Arlington, Va.
LBNP TRAINING OF CREW MEMBERS ON MAIN MISSIONS ABOARD SALYUT-6 ORBITAL STATION
V. M. Mikhaylov, Yu. D. Pometov, and V. A. Andretsov *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 38-44 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 29-33 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-21940# Joint Publications Research Service, Arlington, Va.
ROLE OF MENTAL WORK IN HUMAN TOLERANCE IN TOTAL-BODY VIBRATION
Yu. N. Kamenskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 51-54 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 37-40 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-21984 Department of the Air Force, Washington, D.C.
WINDBLAST ARM PROTECTOR ASSEMBLY Patent
R. J. Cummings, inventor (to Air Force) Issued 13 Nov. 1984 5 p Supersedes AD-D009886
(AD-D011512; US-Patent-4,482,112; US-Patent-Appl-SN-418952; US-Patent-Class-244-122) Avail: US Patent and Trademark Office CSCL 06/7

A windblast arm protector assembly for use by an occupant of an open-type ejection seat of an aircraft is described. The assembly includes, for each arm of the seat occupant, a full length fabric sleeve member which is independent of any garment body, which is a part of the seat's restraint system (rather than an item of personal protective equipment), and which is shaped and dimensioned from the shoulder area to its wrist area in the form of a flexed (i.e., bent) arm. During ejection of the seat and occupant together, the sleeve member is pulled forwardly and adjacent to the occupant's sides by associated co-acting components of the assembly, such that the arm is not extended into the windblast and is protected from it. Unlike the prior art, this arm protector assembly restrains the wrist area of the seat occupant's

arm near the seat ejection handle, while the arm is restrained over its entire length. As a result, the windblast load is uniformly applied, and the restrained arm is protected from injury. GRA

N85-21985*# University of Central Florida, Orlando. Dept. of Industrial Engineering.
NASA: MODEL DEVELOPMENT FOR HUMAN FACTORS INTERFACING Final Report, 15 Nov. 1984 - 15 Jul. 1984
Leighton L. Smith 15 Sep. 1984 116 p refs
(Grant NAG10-0010)
(NASA-CR-175584; NAS 1.26:175584) Avail: NTIS HC A06/MF A01 CSCL 05H

The results of an intensive literature review in the general topics of human error analysis, stress and job performance, and accident and safety analysis revealed no usable techniques or approaches for analyzing human error in ground or space operations tasks. A task review model is described and proposed to be developed in order to reduce the degree of labor intensiveness in ground and space operations tasks. An extensive number of annotated references are provided. Author

N85-21986*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHOULDER AND HIP JOINT FOR HARD SPACE SUITS AND THE LIKE Patent Application
Hubert C. Vykukal, inventor (to NASA) Filed 20 Dec. 1984 21 p
(NASA-Case-ARC-11543-1; NAS 1.71:ARC-11543-1;
US-Patent-Appl-SN-684192) Avail: NTIS HC A02/MF A01 CSCL 06K

Shoulder and hip joints for hard space suits are disclosed which comprising three serially connected truncated spherical sections, the ends of which converge. Ball bearings between the sections permit relative rotation. The proximal end of the first section is connected to the torso covering by a ball bearing and the distal end of the outermost section is connected to the elbow or thigh covering by a ball bearing. The sections are equi-angular and this alleviates lockup, the condition where the distal end of the joint leaves the plane in which the user is attempting to flex. The axes of rotation of the bearings and the bearing mid-planes are arranged to intersect in a particular manner that provides the joint with a minimum envelope. In one embodiment, the races of the bearing between the innermost section and the second section is partially within the inner race of the bearing between the torso and the innermost spherical section further to reduce bulk. NASA

N85-21987*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TORSO SIZING RING CONSTRUCTION FOR HARD SPACE SUIT Patent Application
Hubert C. Vykukal, inventor (to NASA) Filed 20 Dec. 1984 15 p
(NASA-Case-ARC-11616-1; NAS 1.71:ARC-11616-1;
US-Patent-Appl-SN-684193) Avail: NTIS HC A02/MF A01 CSCL 06Q

A hard suit for use in space or diving applications has an adjustable length torso covering that will fit a large variety of wearers. The upper and lower sections of the covering interconnect so that the covering will fit wearers with short torsos. One or more sizing rings may be inserted between sections to accommodate larger torso sizes as required. Since access of the astronaut to the torso covering is preferably through an opening in the back of the upper section (which is closed off by the backpack), the rings slant upward-forward from the lower edge of the opening. The lower edge of the upper covering section has a coupler which slants upward-forward from the lower edge of the back opening. The lower section has a similarly slanted coupler which may interfit with the upper section coupler to accommodate the smallest torso size. Each ring has an upper coupler which may interfit with the upper section coupler and a lower coupler which may interfit with the lower section coupler. NASA

N85-21988# Naval Submarine Medical Research Lab., Groton, Conn.
THE BODY BURDEN OF ORGANIC VAPORS IN ARTIFICIAL AIR TRIAL MEASUREMENTS ABOARD A MOORED SUBMARINE
D. R. Knight, H. J. ONeill, S. M. Gordon, E. H. Luebcke, and J. S. Bowman 19 Dec. 1984 33 p
(AD-A149698; NSMRL-MEMO-84-4) Avail: NTIS HC A03/MF A01 CSCL 13/10

The success of the submarine atmosphere control program has depended solely upon periodic identification of contaminants in the ship's atmosphere. Substances found to exceed safeguard concentrations are controlled by restricting their use aboard ship or scrubbing them from the atmosphere. But, this approach tends to ignore the human host. Advancements in technology now enable biomedical scientists to identify organic gases absorbed by the human body during exposures to industrial environments. We evaluated the potential application of computer-assisted gas chromatography mass spectrometry (GC/MS/COMP) to measuring of volatile organic compounds (VOC's) absorbed by submarine crewmembers. Expired breath samples were collected from watchstanders stationed in the forward space, torpedo room, forward engine space, and engineering space of a fast-attack submarine. Thirteen of the 17 highest concentrations of VOC's were acyclic, C7-C11 alkanes. Assuming that most of the expired VOC's were derived from the submarine, the hydrocarbon composition of the atmosphere was more concentrated and complex than in residential dwellings. This indicates that crewmembers absorb atmospheric VOC's during patrol and desorb the contaminants at home. GRA

N85-21989# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
THE MAN-MACHINE INTERFACE Interim Report
R. U. Ayres Dec. 1984 31 p
(AD-A149971; CMU-RI-TR-84-26) Avail: NTIS HC A03/MF A01 CSCL 05/8

Our basic objective was to define a composite measure of human capabilities that could also be used to measure the skill requirements of various manufacturing tasks. In the course of our research, however, we have come to the conclusion that most human workers (at least in the semiskilled categories) are not employed for their manual skills, or dexterity, but for a different purpose. Although our basic objective remains unchanged, our research focus has shifted to the emerging competition between human workers as machine process controllers in certain highly engineered environments, and the use of sensor-based, computerized systems for the same purpose. Originator-supplied keywords: Automation, Precision control, Computer applications, Machines, Mechanization are included. Author (GRA)

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-21990*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A CONVERGENT SERIES EXPANSION FOR HYPERBOLIC SYSTEMS OF CONSERVATION LAWS Final Report
Eduard Harabetian Feb. 1985 90 p refs
(Contract NAS1-17070)
(NASA-CR-172557; ICASE-85-13; NAS 1.26:172557) Avail: NTIS HC A05/MF A01 CSCL 12A

The discontinuities piecewise analytic initial value problem for a wide class of conservation laws is considered which includes the full three-dimensional Euler equations. The initial interaction at an arbitrary curved surface is resolved in time by a convergent series. Among other features the solution exhibits shock, contact, and expansion waves as well as sound waves propagating on characteristic surfaces. The expansion waves correspond to he one-dimensional rarefactions but have a more complicated structure. The sound waves are generated in place of zero strength shocks, and they are caused by mismatches in derivatives. M.G.

N85-21991*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CUMULUTIVE REPORTS AND PUBLICATIONS THROUGH DECEMBER 31, 1984 Final Report
Mar. 1985 39 p refs
(Contracts NAS1-17070; NAS1-17130; NAS1-15810)
(NASA-CR-172569; NAS 1.26:172569) Avail: NTIS HC A03/MF A01 CSCL 12A

A complete list of the Institute for Computer Applications in Science and Engineering (ICASE) Reports are given. Since ICASE Reports are intended to be preprints of articles that will appear in journals or conference proceedings, the published reference is included when it is available. Topics include numerical methods, parameter identification, fluid dynamics, acoustics, structural analysis, and computers. R.J.F.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-21992* National Aeronautics and Space Administration. Pasadena Office, Calif.
AUTOMATIC MULTI-BANKING OF MEMORY FOR MICROPROCESSORS Patent
Gordon A. Wiker, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 6 Nov. 1984 10 p Filed 7 Aug. 1981 Supersedes N82-11785 (20 - 02, p 0250) Sponsored by NASA
(NASA-Case-NPO-15295-1; NAS 1.71:NPO-15295-1;
US-Patent-4,481,570; US-Patent-Appl-SN-291645;
US-Patent-Class-364-200) Avail: US Patent and Trademark Office CSCL 09B

A microprocessor system is provided with added memories to expand its address spaces beyond its address word length capacity by using indirect addressing instructions of a type having a detectable operations code and dedicating designated address spaces of memory to each of the added memories, one space to a memory. By decoding each operations code of instructions read from main memory into a decoder to identify indirect addressing instructions of the specified type, and then decoding the address that follows in a decoder to determine which added memory is associated therewith, the associated added memory is selectively enabled through a unit while the main memory is disabled to permit the instruction to be executed on the location to which the effective address of the indirect address instruction points, either before the indirect address is read from main memory or afterwards, depending on how the system is arranged by a switch.

Official Gazette of the U.S. Patent and Trademark Office

N85-21993 Department of the Air Force, Washington, D.C.
VARIABLE DATA BASE GENERATOR APPARATUS Patent
J. J. Maier, J. P. Woodard, J. V. Ferrante, and M. A. Heffron, inventors (to Air Force) Issued 20 Nov. 1984 5 p Supersedes AD-D009107
(AD-D011515; US-Patent-4,484,297; US-Patent-Appl-SN-308972; US-Patent-Class-364-717) Avail: US Patent and Trademark Office CSCL 09/2

The present invention relates broadly to a binary word generator apparatus, and in particular to a variable data base generator apparatus. An apparatus for generating a variable data base file from a single original entry control datum. The apparatus utilizes a microprocessor unit to interact with a logical number generator to modify the original entry control signal into a larger data base which may be similar to but not identical to the original datum signal. GRA

N85-21994# Committee on Science and Technology (U. S. House).
COMPUTER AND COMMUNICATIONS SECURITY AND PRIVACY
Washington GPO 1985 133 p refs Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 123, 24 Sep. 1984
(GPO-39-741) Avail: Subcommittee on Transportation, Aviation and Materials

Computer and communications security and privacy were discussed. Better ways for storage and making information available and at the same time protecting the information are explored. Computer management, automated systems, protection of data, government and industry relations computer fraud and crime, economic viability, certification, and professional ethics are addressed. E.A.K.

N85-21995# General Electric Co., Pittsfield, Mass. Ordnance Systems.
ELECTRICAL CHARACTERIZATION OF ANALOG MICROPROCESSORS Final Report, May 1981 - Sep. 1983
B. W. Hajduk, G. Forman, J. Smolenski, J. Salatino, and D. OConnor Griffiss AFB, N.Y. RADC Aug. 1984 136 p
(Contract F30602-81-C-0149)
(AD-A149629; RADC-TR-84-150) Avail: NTIS HC A07/MF A01 CSCL 09/2

Two digital signal processors, the 2920 and TMS32010, were characterized on this contract. A test pattern and program were developed for the 2920 and data was taken to determine its operating region. The characterization of the TMS32010 consisted of the analysis of the functional test which will be included in a MIL-M-38510 slash sheet for the device. Other tasks included a survey of available and planned general purpose digital signal processors, the development of a test philosophy for modified Booth's algorithm multipliers, and the evaluation of the applicability of Walsh functions to the testing of D/A converters. GRA

N85-21996# Parke Mathematical Labs., Inc., Carlisle, Mass.
TOPICS IN OPTICAL MATERIALS AND DEVICE RESEARCH, 3. VOLUME 2 Final Technical Report, Dec. 1980 - Dec. 1983
T. B. Barrett, R. Marshall, C. Warde, J. Caulfield, and M. M. Salour Aug. 1984 131 p
(Contract F19628-81-C-0052)
(AD-A149727; RADC-TR-84-73-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09/2

Operating instructions, program listings, etc., for a GP1B interface for a Nicolet 1080 computer are given. The design of this interface was given in RADC-TR-81-372, Volume II dated January 1982. The purpose of this volume of the Final Report is to update Final Technical Report RADC-TR-81-372 (Vol. II), January 1982. This update consists primarily of listings of revised assembly language code for both NIC and CTL; the biggest change being that is no longer necessary to down load the operational code from NIC to CTL, since this code has been stored in the CTL EPROM. In addition more descriptive material is included on using the NIC software with emphasis on its use to control the Hamamatsu C1000 camera. GRA

N85-21997# Illinois Univ., Urbana. Computer Systems Group.
BUILT-IN TESTS FOR VLSI (VERY LARGE SCALE INTEGRATION) FINITE-STATE MACHINES
K. A. Hua Aug. 1984 46 p
(AD-A149784; CSG-33) Avail: NTIS HC A03/MF A01 CSCL 09/2

The introduction of LSI/VLSI technology has increased the difficulty of both designing and testing the complex systems which

can be implemented to a chip. The testing problem, especially, is felt to be the primary bottleneck to the widespread use of the next generation of VLSI chips. Design for testability has been proposed as a solution to this problem. We have developed a built-in test scheme for VLSI finite-state machines using PLAs, unlike other built-in test schemes for PLA. The difficulty in interconnecting the test logic and the naked PLA is considered. The layout has been done for the test logic cells and example PLA in nMOS technology to demonstrate that all the test logic cells line up perfectly with the PLA cells. This eliminates the interconnection problems. This scheme, using a universal test set, allows a finite-state machine implemented with a PLA to be tested with in a number of cycles that is proportional to the number of inputs and product terms. By modifying the single-bit decoders, a test pattern generator is available for testing of the AND-plane at a low cost. The use of the feedback NOR gates of the Augmented Decoder to detect stuck-at faults and short faults of the columns in the AND-plane saves a lot of hardware since another parity checker would otherwise have to be used. By using the multiplexing scheme, the sizes of the shift registers are also cut down in half compared with other PLA testing schemes. GRA

N85-21998# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
RAPIDBUS: DESIGN OF AN EXTENSIBLE MULTIPROCESSOR STRUCTURE Interim Report
John C. Willis and Arthur C. Sanderson May 1984 161 p Sponsored in part by NSF
(Contract F49620-83-C-0100)
(AD-A150061; CMU-RI-TR-84-13) Avail: NTIS HC A08/MF A01 CSCL 09/2

Research in areas of robotics such as machine vision and control systems can benefit from appropriate increases in the available computational power. If algorithms can be structured to take advantage of task level concurrency, a multiprocessor design can provide cost-effective enhancements to the computational resources while decreasing the impact of subsystem failures. RAPIDbus is described in this report as two evolutionary steps in the development of a system to support research in advanced, integrated, sensor based robotic systems. RAPIDbus I, a four processor architecture, is evaluated based on a two processor implementation fabricated in the laboratory. Building on the first design, RAPIDbus 2 is described as an extensible, high performance, packet switched structure supporting a multitude of heterogeneous processor-memory nodes. Both RAPIDbus architectures assume a single address space populated by a moderate number of comparatively powerful processors. RAPIDbus 2 goes beyond the breadth of the earlier architecture by assembling groups of fifteen processors into ensembles called societies. Packet repeaters between societies allow up to sixteen ensembles to be assembled in a problem-dependent configuration within a single shared address space. Although not realized in the current proof-of-concept system, an object layer interface was suggested to maintain cache coherency, support strong data typing, and assist in dynamic memory management. GRA

N85-21999# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
INSTRUMENTATION AWARD Final Scientific Report, 15 Jul. 1983 - 14 Jul. 1984
Virginia Klema Nov. 1984 5 p
(Grant AF-AFOSR-0305-83; AF Proj. 2917)
(AD-A150081; AFOSR-84-1183TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This document describes the fabrication of expanded concurrent computing equipment for research on numerical methods in a concurrent microprocessor based on environment. The grant permitted the acquisition of the Intel 86/380 six processor configuration, one additional processor for the expanded 86/330 system, and the ROM burner for the Intel development system. The augmented system provides a concurrent computing environment that permits research in operating systems and programming language constructs for numerical methods. The investigator's research concentrates on scientific applications, in particular signal processing and image processing. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-22000 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
A SURVEY OF THE PROJECT CIP: COMPUTER AIDED, INTUITION-GUIDED PROGRAMMING. WIDE SPECTRUM LANGUAGE AND PROGRAM TRANSFORMATIONS
Br. Moeller, ed. Jul. 1984 38 p refs Sponsored by Deutsche Forschungsgemeinschaft
(TUM-I8406) Copyright. Avail: Issuing Activity

The Computer Aided Intuition Guided Project (CIP) language, system, transformations and programming methodology, theoretical foundations, applications, and sublanguage compiler are discussed. Developments of the wide spectrum language CIP-L, and the program development system CIP-S are outlined. Author (ESA)

N85-22001*# Hawaii Univ., Manoa. Dept. of Electrical Engineering.
A CONCATENATED CODING SCHEME FOR ERROR CONTROL
Shu Lin 20 Mar. 1985 12 p refs
(Grant NAG5-407)
(NASA-CR-175504; NAS 1.26:175504) Avail: NTIS HC A02/MF A01 CSCL 09B

A concatenated coding scheme for error control in data communications is analyzed. The inner code is used for both error correction and detection, however the outer code is used only for error detection. A retransmission is requested if the outer code detects the presence of errors after the inner code decoding. The probability of undetected error of the above error control scheme is derived and upper bounded. Two specific exmaples are analyzed. In the first example, the inner code is a distance-4 shortened Hamming code with generator polynomial $(X+1)(X(6)+X+1) = X(7)+X(6)+X(2)+1$ and the outer code is a distance-4 shortened Hamming code with generator polynomial $(X+1)X(15+X(14)+X(13)+X(12)+X(4)+X(3)+X(2)+X+1) = X(16)+X(12)+X(5)+1$ which is the X.25 standard for packet-switched data network. This example is proposed for error control on NASA telecommand links. In the second example, the inner code is the same as that in the first example but the outer code is a shortened Reed-Solomon code with symbols from GF(2(8)) and generator polynomial $(X+1)(X+alpha)$ where alpha is a primitive element in GF(z(8)). Author

N85-22002*# Systems and Applied Sciences Corp., Hampton, Va.
EARTH RADIATION BUDGET EXPERIMENT SOFTWARE DEVELOPMENT Final Report
W. L. Edmonds Apr. 1985 88 p refs
(Contract NAS1-16571)
(NASA-CR-172567; NAS 1.26:172567) Avail: NTIS HC A05/MF A01 CSCL 09B

Computer programming and analysis efforts were carried out in support of the Earth Radiation Budget Experiment (ERBE) at NASA/Langley. The Earth Radiation Budget Experiment is described as well as data acquisition, analysis and modeling support for the testing of ERBE instruments. Also included are descriptions of the programs developed to analyze, format and display data collected during testing of the various ERBE instruments. Listings of the major programs developed under this contract are located in an appendix. Author

N85-22003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ALGORITHM FOR GENERATING ABSTRACT SYNTAX TREES Final Report

Robert E. Noonan Jan. 1985 19 p refs
(Contract NAS1-17070)
(NASA-CR-172541; ICASE-85-4; NAS 1.26:172541) Avail: NTIS HC A02/MF A01 CSCL 09B

The notion of an abstract syntax is discussed. An algorithm is presented for automatically deriving an abstract syntax directly from a BNF grammar. The implementation of this algorithm and its application to the grammar for Modula are discussed. Author

N85-22004*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PISCES: AN ENVIRONMENT FOR PARALLEL SCIENTIFIC COMPUTATION Final Report
Terrence W. Pratt Feb. 1985 32 p refs Submitted for publication
(Contract NAS1-17070; Grant NAG1-467)
(NASA-CR-172544; ICASE-85-12; NAS 1.26:172544) Avail: NTIS HC A03/MF A01 CSCL 09B

The parallel implementation of scientific computing environment (PISCES) is a project to provide high-level programming environments for parallel MIMD computers. Pisces 1, the first of these environments, is a FORTRAN 77 based environment which runs under the UNIX operating system. The Pisces 1 user programs in Pisces FORTRAN, an extension of FORTRAN 77 for parallel processing. The major emphasis in the Pisces 1 design is in providing a carefully specified virtual machine that defines the run-time environment within which Pisces FORTRAN programs are executed. Each implementation then provides the same virtual machine, regardless of differences in the underlying architecture. The design is intended to be portable to a variety of architectures. Currently Pisces 1 is implemented on a network of Apollo workstations and on a DEC VAX uniprocessor via simulation of the task level parallelism. An implementation for the Flexible Computing Corp. FLEX/32 is under construction. An introduction to the Pisces 1 virtual computer and the FORTRAN 77 extensions is presented. An example of an algorithm for the iterative solution of a system of equations is given. The most notable features of the design are the provision for several granularities of parallelism in programs and the provision of a window mechanism for distributed access to large arrays of data. Author

N85-22005# Texas Univ., Austin. Inst. for Computing Science.
A GYPSY-TO-ADA PROGRAM COMPILER
Robert L. Akers Dec. 1983 104 p refs
(TR-39) Avail: NTIS HC A06/MF A01

Gypsy is a language developed to support a methodology for formally specifying, implementing, and verifying computer software. Developed from Pascal it is a concise, clean and very modular language in the lineage rooted in ALGOL 60. The design and initial implementation of a Gypsy compiler which targets to Ada is described. The compiler is the combination of a LISP module integrated into the Gypsy Verification Environment and packages of support routines written in Ada. The compiler converts an internal form of a Gypsy program maintained by the verification system into Ada source, which may then be compiled along with the support packages in any Ada environment. Using the Gypsy verification methodology and tools to perform the actual task of program verification and then applying the compiler to obtain Ada code with the same semantics results in Ada code which may be used with much the same confidence as the verified Gypsy program. A.R.H.

N85-22006# Los Alamos Scientific Lab., N. Mex. Computing Div.
COMPUTING DIVISION TWO-YEAR OPERATIONAL PLAN, FY 1984 - 1985
Robert H. Ewald Jan. 1984 212 p refs
(Contract W-7405-eng-36)
(LA-9978-MS) Avail: NTIS HC A10/MF A01

An operational plan for the Computing Division of the Los Alamos National Laboratory for fiscal years 1984 and 1985 is described. Subjects discussed include the planning process, critical issues, network components, major hardware and software projects, direct user services, external activities, research and advanced development projects, and administration. Recommendations from the technology information panel and the computer users' priorities task force are included as appendixes. Author

N85-22007# Los Alamos Scientific Lab., N. Mex.
THE LINER PACKAGE: AN INCIPIENT MHD CAPABILITY FOR CCUBE
Galen R. Gisler and Rickey J. Faehl Feb. 1984 10 p refs
(Contract W-7405-eng-36)
(LA-9969-MS) Avail: NTIS HC A02/MF A01

A code package for moving deformable conductors has been developed for use with the PIC simulation code CCUBE. In the code package, called LINER, moving conductor elements are each characterized by finite conductivity, mass, and volume. Ohmic currents can arise in the elements, and they can be accelerated by forces exerted by the electromagnetic field. The elements can also change shape and volume. Author

N85-22008# Los Alamos Scientific Lab., N. Mex.
A LINEAR CHARACTERISTIC-NODAL TRANSPORT METHOD FOR THE TWO-DIMENSIONAL (X,Y)-GEOMETRY MULTIGROUP DISCRETE ORDINATES EQUATIONS OVER AN ARBITRARY TRIANGLE MESH Ph.D. Thesis - Florida Univ., Gainesville
Richard R. Paternoster May 1984 138 p refs
(Contract W-7405-eng-36)
(LA-10092-T) Avail: NTIS HC A07/MF A01

A semi-analytic numerical solution to the two-dimensional (x,y)geometry multigroup discrete ordinates transport equations over a mesh of arbitrarily shaped triangles is derived. The numerical method uses the analytic solution of the discrete ordinates equations with a linear function for the source to generate a linear representation of the angular flux on the boundaries of the triangle. Two cases must be solved for triangular mesh cells; inflow through one face and inflow through two faces of the triangle. The one inflow side problem is solved by the linear characteristic method. The characteristic solution is used to formulate a linear moment representation of the angular flux on the two outflow faces of the triangle. The two inflow sides case is solved by the linear nodal method. The linear characteristic-nodal (LCN) method is compared against other two-dimensional spatial differencing methods for accuracy and positivity. The semi-analytic method is shown to be superior in accuracy and positivity to the diamond difference (DD) spatial schemes for all test cases. Author

N85-22009# Los Alamos Scientific Lab., N. Mex.
USER'S GUIDE FOR TWODANT: A CODE PACKAGE FOR TWO-DIMENSIONAL, DIFFUSION-ACCELERATED, NEUTRAL-PARTICLE TRANSPORT
Ray E. Alcouffe, Forrest W. Brinkley, Duane R. Marr, and R. Douglas ODell Mar. 1984 43 p refs
(Contract W-7405-eng-36)
(LA-10049-M) Avail: NTIS HC A03/MF A01

TWODANT solves the two-dimensional multigroup transport equation in x,y and r,z geometries. Both regular and adjoint, inhomogeneous (fixed source) and homogeneous (k-effective) problems subject to vacuum, reflective, periodic, or white boundary conditions are solved. General anisotropic scattering is allowed and anisotropic inhomogeneous sources are permitted. G.L.C.

N85-22010# Los Alamos Scientific Lab., N. Mex.
ZTL: A SUBROUTINE PACKAGE FOR THE IBM PERSONAL COMPUTER TO SUPPORT THE ZIATECH ZT1488 IEEE-488 CONTROLLER
Frank McGirt and Kurt Moore Jun. 1984 22 p refs
(Contract W-7405-eng-36)
(LA-10141-MS) Avail: NTIS HC A02/MF A01

The XTL subroutine package is a set of assembly language subroutines that are callable from Supersoft FORTRAN and provide direct access to the Ziatech IEEE-488 interface hardware. These routines provide functions that are normally available only from assembly language and allow the programmer greater capability when using Supersoft FORTRAN. This is especially important in

the development of applications programs that interface directly to hardware. Author

N85-22011# Los Alamos Scientific Lab., N. Mex.
ADAPTIVE MESHES IN THE 2DL CODE
W. D. Barfield Dec. 1983 80 p refs
(Contract W-7405-eng-36)
(LA-9936-MS) Avail: NTIS HC A05/MF A01

An adaptive mesh capability was added to the 2DL two-dimensional continuum mechanics code by incorporating continuous rezoning, making use of the SALE code advection scheme. A variety of adaptive meshes is possible, including Eulerian, mixed Euler-Lagrange, equispaced, and orthogonal curvilinear. Material interfaces correspond to mesh lines: there are no mixed cells. Results are given for several test problems including plane and reflected shocks, cylindrical and spherical implosions (similarity solutions), and phased implosion (formation of axial shock). Author

N85-22012# Los Alamos Scientific Lab., N. Mex.
DOS 21: PCDOS 2.0 SUPPORT SUBROUTINE PACKAGE FOR THE IBM PERSONAL COMPUTER
Frank McGirt Jun. 1984 9 p refs
(Contract W-7405-eng-36)
(LA-10142-MS) Avail: NTIS HC A02/MF A01

The DOS21 subroutine was developed to provide direct access to selected PCDOS 2.0 system calls from Supersoft FORTRAN. These system calls, which are normally available only from assembly language, allow the programmer greater capability when using Supersoft FORTRAN. This is especially advantageous in the development of programs that interface directly to hardware. Author

N85-22013# Los Alamos Scientific Lab., N. Mex.
A SUBROUTINE PACKAGE FOR THE IBM PERSONAL COMPUTER TO SUPPORT THE HERCULES GRAPHIC CARD
Frank McGirt [1983] 15 p refs
(Contract W-7405-eng-36)
(LA-10144-MS) Avail: NTIS HC A02/MF A01

The HGRAPH subroutine package is a set of assembly language subroutines. They are callable from Supersoft FORTRAN and provide direct access to the Hercules Graphics firmware. These routines provide functions normally available only from assembly language and allow the programmer greater capability when using Supersoft FORTRAN. Author

N85-22014# Los Alamos Scientific Lab., N. Mex.
ZTLCK: A SUBROUTINE PACKAGE FOR THE IBM PERSONAL COMPUTER TO SUPPORT THE ZIATECH ZT1488 REAL TIME CLOCK
1983 15 p refs
(Contract W-7405-eng-36)
(LA-10146-MS) Avail: NTIS HC A02/MF A01

The ZTLCK subroutine package for the IBM Personal Computer is a set of assembly language subroutines that are callable from Supersoft FORTAN. This is especially advantageous in the development of application programs that interface directly to hardware. Author

N85-22015# Los Alamos Scientific Lab., N. Mex.
TRANIO: A SUBROUTINE PACKAGE FOR THE IBM PERSONAL COMPUTER TO SUPPORT THE TRANSFER 6002 CAMAC CRATE CONTROLLER
Frank McGirt [1983] 18 p refs
(Contract W-7405-eng-36)
(LA-10145-MS) Avail: NTIS HC A02/MF A01

The TRANIO subroutine package is a set of assembly language subroutines that are callable from Supersoft FORTRAN and provide direct access to Transiac CAMAC interface hardware. These routines provide functions that are normally available only from assembly language and allow the programmer greater capability when using Supersoft FORTRAN. This is especially important in the development of application programs that interface directly to hardware. Author

N85-22016# Argonne National Lab., Ill. Mathematics and Computer Science Div.
THE AUTOMATED REASONING SYSTEM ITP
Ewing L. Lusk and Ross A. Overbeek Apr. 1984 62 p refs
(Contract W-31-109-eng-38)
(ANL-84-27) Avail: NTIS HC A04/MF A01

A system designed to provide a portable environment for the study of automated reasoning is described. The system is built on the LMA automated reasoning subroutine package. This program is not part of IMA itself but illustrates the level of inference based system that can be constructed from the LMA package of tools. It is a clause based reasoning system supporting a wide variety of techniques which have proven valuable over the years in a long running automated deduction research project. In addition, it is designed to present a convenient, interactive interface to its user. Author

N85-22017# Texas Univ., Austin. Inst. for Computing Science.
TOWARDS THE GENERATION OF EFFICIENT CODE FROM VERIFIED PROGRAMS Ph.D. Thesis
John McHugh Mar. 1984 112 p refs
(TR-40) Avail: NTIS HC A06/MF A01

The characteristics of computer programming languages intended for the implementation of provably correct programs and of the characteristics of programs written in these languages were investigated. It was discovered that potential run time exceptions and the necessity of providing a rigorously correct implementation of exception handlers dominate the potential control paths of programs written in verifiable languages that the usual code optimization techniques are ineffective. It was further discovered that the call intensive control structures of these programs, necessitated by verification constraints, also thwart optimization and lead to inefficient code. It is shown that theorems can be derived at potential exception sites which, if true, guarantee that the exception condition will never arise permitting removal of the exception path from the program's flow graph. These theorems are proved using the automatic theorem prover which is part of the program verification system. It is also shown that many of the routine calls contained in verifiable programs may be reduced in expense by converting parameters to global variables or eliminated completely by expanding the called routines at their call sites. Both the exception suppression and call reduction techniques reduce the complexity of the program's call graph and facilitate conventional optimizations. Several examples are presented and the potential improvements in code size resulting from the application of these techniques are discussed. Author

N85-22018# Los Alamos Scientific Lab., N. Mex.
A USER'S GUIDE TO SENSITIVITY TESTING ON COMPUTER MODELS AT LOS ALAMOS NATIONAL LABORATORY
Donna S. Williams Jun. 1984 78 p refs
(Contract W-7405-eng-36)
(LA-10104-M) Avail: NTIS HC A05/MF A01

The manual provides the user with a step-by-step procedure to use sensitivity testing on computer simulation models based upon the Dynamo programming language. The first step of the testing procedure is deciding which input parameters to use, the output variables needed, and the time span of the model to be tested. The Latin hypercube sampling program is run using all these parameters to determine the sample which will be modeled. The reruns from the sample are entered in a data file that is transferred to the Dartmouth time-sharing system and appended to the end of the Dynamo model. This model is then transferred back to a VAX system. Programs specifically designed for these simulation models are used to produce time-series plots, cross plots, and time plots of summary statistics and significant coefficients. These plots are used by the modeler to determine what effect the input parameters had on the output variables. Included are examples of the steps needed to produce the model and examples of the plots and tables used for interpretation. Author

N85-22019# Institute for Image Processing Computer Mapping, Graz (Austria).

IMPLEMENTATION OF THE COMPUTER PROGRAM-SYSTEM MOSS (MAP OVERLAY AND STATISTICAL SYSTEM) ON A VAX-11 SERIES COMPUTER UNDER VMS Final Technical Report, Dec. 1983 - Sep. 1984

M. Ranzinger Oct. 1984 55 p

(Contract DAJA45-84-C-0011; DA Proj. 1T1-61102-BH-57)

(AD-A149612) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the work done for transferring the MOSS (Map Overlay and Statistical System) Software package to a VAX-11 series computer running under VMS. Besides correcting syntactic incompatibilities and logical errors the main tasks were the conversion of all display commands to industry standard software and the programming of some additional functions. All major changes and extensions which were necessary or were thought useful are described in detail in Chapters 2 and 3. For a better understanding of these two chapters a revised overview of the whole MOSS-system is given in the first chapter. Chapter 4 deals with the data and workfile structures used in MOSS and describes how input from other geoinformation-or digitizing systems is handled. A description of the MOSS main command procedure, a table of all MOSS commands in the MOSS-VAX version and of additional available programs is given in the fifth chapter. At the end of the report a set of plots and prints is presented which have been compiled to test the correctness of the implemented MOSS functions. Besides this final technical report a revised MOSS USER'S MANUAL and a revised MOSS SYSTEM REFERENCE MANUAL have been compiled. Author (GRA)

N85-22020# Naval Postgraduate School, Monterey, Calif. Computer Science Dept.

THE FOUR FORMS OF OMEGA

B. J. MacLennan Dec. 1984 35 p

(AD-A149694; NPS52-84-026) Avail: NTIS HC A03/MF A01 CSCL 09/2

We describe four alternative syntactic forms for the object-oriented, rule-based language omega. These notations are all different concrete representations of the same abstract language. The first notation uses a predicate logic style. The second has a stylized natural language format. The third extends the second by providing anaphoric reference. The fourth form drops the linear syntax of the first three in favor of a two-dimensional format based on the idea of a form. GRA

N85-22021# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

TEKEDIT: AN ENHANCED EDITOR FOR DIRECT VIEW STORAGE TUBE (DVST) GRAPHICS DISPLAY DEVICES Final Technical Report

M. Johnson Nov. 1984 16 p

(AD-A149715; AD-E440265; ARLCB-TR-84040) Avail: NTIS HC A02/MF A01 CSCL 09/2

An overview and functional description of an editor for host files using Direct View Storage Tubes (DVST) with enhanced refresh capabilities is given. Tekedit is an editor designed to augment a system editor for creating or modifying host files using a graphics terminal as the display device. The initial implementation of Tekedit is for a Tektronix 4114 on an IBM 4341 running VM/CMS. GRA

N85-22022# Navy Personnel Research and Development Center, San Diego, Calif. Training Lab.

A COMPUTER-BASED GAMING SYSTEM FOR ASSESSING RECOGNITION PERFORMANCE (RECOG) Technical Report, Sep. 1983 - Sep. 1984

G. A. Little, D. H. Maffly, C. L. Miller, D. M. Setter, and P. A. Federico Jan. 1985 99 p

(AD-A149752; NPRDC-TL-85-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report documents a computer-based gaming system for assessing recognition performance (RECOG). This was done so that others who may want to use it either for research, development, or operational implementation will have an easier time comprehending the modularity of the programming structure as well as how specific procedures can be adapted to suit a user's unique situation. The game management system is programmed in a modular manner to: instruct the student on how to play the game, retrieve and display individual images, keep track of how well individuals play and provide them feedback, and link these components by supervising routines inorder to execute the game. The game, then, provides a set of software tools which can be used by others who want to assess recognition performance. The software for the complete gaming system is currently on three floppy disks which control the play of the game, contain the graphic-images database, and maintain records of individuals' recognition performances. The game itself is run with two dual-density disks on the Terak microcomputer employing two drives. A third disk containing game management facilities can be used by test administrators or researchers to format the recognition data to facilitate statistical analyses. Also, this third disk can be used to design a new game completely different set of graphic images to act as stimuli for recognition testing. GRA

N85-22023# RAND Corp., Santa Monica, Calif.

THE PORTABLE LISP TRANSLATION TOOL Interim Report

J. Marti Sep. 1984 44 p

(Contract MDA903-82-C-0061; ARPA Order 3460)

(AD-A149765; RAND/N-2152-ARPA) Avail: NTIS HC A03/MF A01 CSCL 09/2

A manual describing the construction, syntax, operation, and deficiencies of the PORTARE interdialect LISP translation program at Rand. There are several important dialects of the LISP programming language, namely, Interlisp, Franz Lisp, Common Lisp, Portable Standard LISP (PSL), Cambridge Lisp, and Lisp 370. Programs implemented in one dialect are usually not directly transportable to another. The PORTARE program was developed to automatically translate programs from one LISP dialect to another and to support their execution in the target system. It features a pattern-directed translator coupled with a scheme for incremental translation of the individual modules of large programs. The run time environment supports deficiencies of the target LISP system. PORTARE is currently capable of translating between Interlisp and PSL (in both directions), and from Franz Lisp into PSL. GRA

N85-22024# Naval Research Lab., Washington, D. C.

INTERFACE SPECIFICATIONS FOR SCR (SOFTWARE COST REDUCTION) (A-7E) EXTENDED COMPUTER MODULE, REVISED

D. L. Parnas, D. M. Weiss, P. C. Clements, and K. H. Britton 31 Dec. 1984 128 p Supersedes NRL-MR-4843

(F21-243)

(AD-A149948; NRL-MR-5502-Rev; NRL-MR-4843) Avail: NTIS HC A07/MF A01 CSCL 09/2

This document describes the programmer interface to a computing machine partially implemented in software. The Extended Computer is part of NRL's Software Cost Reduction (SCR) project, to demonstrate the feasibility of applying advanced software engineering techniques to complex real-time systems in order to simplify maintenance. The Extended Computer allows code portability among avionics computers by providing extensible addressing, uniform i/o and data access, representation-independent data types, uniform event signalling, a standard subprogram invocation mechanism, and parallel process capability. The purpose of the Extended Computer is to allow the remainder of the software to remain unchanged when the host computer is changed or replaced. This report describes the modular structure of the Extended Computer, and contains the abstract interface specifications for all the facilities provided to users. It serves as development and maintenance documentation for the SCR software design, and is also intended as a model for other people interested in applying the abstract interface approach on other software projects. Additional keywords included: real time, systems engineering. GRA

N85-22025# Naval Postgraduate School, Monterey, Calif.

AN INTERACTIVE ENVIRONMENT FOR THE DEVELOPMENT OF AN EXPERT SYSTEM IN ZOG M.S. Thesis

D. Butler, III Jun. 1984 63 p
(AD-A149954) Avail: NTIS HC A04/MF A01 CSCL 09/2

ZOG is a rapid-response, large-network, menu-selection human-computer interface implemented on the PERQ microcomputer. This thesis develops a framework for and discusses issues relative to implementing the OPS7 expert system language as an interactive programming environment in ZOG. It begins by tracing the history of ZOG's frame structure are explained. A discussion of the expert system language used in ZOG, OPS7, is presented to acquaint the reader with its character. The subnet schemes required to run an OPS7 style interpreter agent are developed and the user's perspective of the agent is presented. Finally, recommendations for future work in this area are made. Additional keywords included: Management information systems, Shipboard aircraft carriers, AIRPLAN rule based expert system, Programming languages. Author (GRA)

N85-22026# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.
VERY-HIGH LEVEL CONCURRENT PROGRAMMING Ph.D. Thesis
Y. Shi Dec. 1984 260 p
(Contract N00014-83-K-0560)
(AD-A150009) Avail: NTIS HC A12/MF A01 CSCL 09/2

The prime contribution of this dissertation is the creation of a programming style and environment that allows the human designers to develop an implementation independent, very high level functional view of concurrent systems. The translation of this view into a concurrently operating system is performed automatically. There is an emphasis on the human engineering aspects of the designer - computer interactions. The designers specify the problem through declaring variable structures and composing equations which relate the variables. The designers of a concurrent system interact with automatic systems on two levels: On the global level, the Configurator accepts as input a graph of the network of subsystems, modules and files. It verifies the validity of interfaces and implements the network by generating command language programs that set up communications and optimize parallelism among modules. The modules are executed under multiprogramming time sharing operating systems in respective sequential processors in a network. On the local level, the MODEL Compiler accepts as input an individual module specification. It performs checking of completeness and consistency of variables and equations and generates an optimized sequential program in a high level language (PL/I). GRA

N85-22027# American Society for Engineering Education, Washington, D. C.
DESIGN OF GRAPHIC DISPLAYS IN COMPUTERIZED SYSTEMS Quarterly Report, 1 Sep. - 30 Nov. 1984
Kevin Bennett 30 Nov. 1984 19 p
(Contract N00014-83-D-0689)
(AD-A150071) Avail: NTIS HC A02/MF A01 CSCL 09/2

This research paper investigates how the design of a computer system can influence the manner in which people use that system. As people interact with a system they begin to have a feeling for the tasks they can accomplish with the system and how to accomplish these tasks most efficiently. This knowledge will be referred to as the user's mental model of a computer system. The underlying assumption of the present research is that the design of a computer system can influence the quality of the user's mental model of that system. A mental model can be appropriate or inappropriate for a given system which, in turn, influences performance with that system. GRA

N85-22028# Stanford Univ., Calif. Systems Optimization Lab.
USER'S GUIDE FOR NPSOL (VERSION 2.1): A FORTRAN PACKAGE FOR QUADRATIC PROGRAMMING
Phillip E. Gill, Walter Murray, Michael A. Saunders, and Margaret H. Wright Sep. 1984 42 p
(Contracts N00014-75-C-0267; DAAG29-81-K-0156; DE-AT03-76ER-72018; DE-AM03-76SF-00326; Grants NSF MCS-79-26009; NSF ECS-83-12142)
(AD-A150078; SU-SOL-84-7; ARO-21592.3-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report forms the user's guide for Version 2.1 of NPSOL, a set of FORTRAN subroutines designed to minimize a smooth function subject to constraints, which may include a simple bounds on the variables, linear constraints and smooth nonlinear constraints. (NPSOL may also be used for unconstrained, bound-constrained and linearly constrained optimization.) The user must provide subroutines that define the objective and constraint functions and their gradients. All matrices are treated as dense, and hence NPSOL is not intended for large sparse problems. NPSOL uses a sequential quadratic programming (SQP) algorithm, in which the search direction is the solution of a quadratic programming (QP) subproblem. The algorithm treats bounds, linear constraints and nonlinear constraints separately. The Ilessian of each QP subproblem is a positive-definite quasi-Newton approximation to the Ilessian of the Lagrangian function. The steplength at each iteration is required to produce a sufficient decrease in an augmented Lagrangian merit function. Each QP subproblem is solved using a quadratic programming package with several features that improve the efficiency of an SQP algorithm. GRA

N85-22029# California Univ., Livermore. Lawrence Livermore Lab.
MFTF SENSOR VERIFICATION COMPUTER PROGRAM
Harry K. Chow 9 Nov. 1984 26 p
(Contract W-7405-eng-48)
(DE85-004452; UCID-30209) Avail: NTIS HC A03/MF A01

The design, requirements document and implementation of the MFE Sensor Verification system were accomplished by the Measurement Engineering Section (MES), a group which provides instrumentation for the MFTF magnet diagnostics. The sensors, installed on and around the magnets and solenoids, housed in a vacuum chamber, will supply information about the temperature, strain, pressure, liquid helium level and magnet voltage to the facility operator for evaluation. As the sensors are installed, records must be maintained as to their initial resistance values. Also, as the work progresses, monthly checks will be made to insure continued sensor health. Finally, after the MFTF-B demonstration, yearly checks will be performed as well as checks of sensors as problem develops. DOE

N85-22030# Los Alamos Scientific Lab., N. Mex.
EZPIX: A TABLET ENTRY METHOD FOR COMPUTER-GENERATED SLIDES, DRAWINGS, AND GRAPHS
Joel M. Williams Sep. 1984 27 p
(Contract W-7405-eng-36)
(DE85-005234; LA-10208-M) Avail: NTIS HC A03/MF A01

A minicomputer-based program, called EZPIX, connects the host computer graphics system to a tablet on which one can digitize input and specify graphics commands from a menu. A minicomputer terminal serves as editor and provides local graphics output. The magic button does practically everything else. It signs you on, starts, builds, ends, executes and saves your command file, and signs you off. It even allows you to make a composite picture from an assortment of inappropriately sized originals. The graph and pie chart modes are handy, too. DOE

N85-22031# EG and G Washington Analytical Services Center, Inc., Morgantown, W. Va.
METC VAX-IBM GUIDE TO ASPEN
K. E. Williams and P. A. Regenhardt Nov. 1984 122 p refs
(Contract DE-AC21-81MC-14521)
(DE85-001974; DOE/METC-85/9) Avail: NTIS HC A06/MF A01

This guide serves as a handbook for operating the public version of ASPEN as installed and supported by METC on the VAX computer operating under the VMS operating system as well as on the IBM 3033 computer at Argonne National Laboratory operating under the MVS operating system with CMS/SP. This guide should be used along with Volumes 1 and 2 of MIT's ASPEN User's Manual. DOE

N85-22032# EG and G Washington Analytical Services Center, Inc., Morgantown, W. Va.
VAX-ASPEN INSTALLATION GUIDE
K. E. Williams Nov. 1984 290 p refs
(Contract DE-AC21-81MC-14521)
(DE85-001973; DOE/METC-85-8) Avail: NTIS HC A13/MF A01
Information necessary to install the ASPEN computerized simulation program on the VAX system is provided. DOE

N85-22033# Argonne National Lab., Ill.
SOFTWARE FOR SPECIAL FUNCTIONS
W. J. Cody Oct. 1984 19 p refs
(Contract W-31-109-eng-38)
(DE85-004684; ANL-MCS-TM-37) Avail: NTIS HC A02/MF A01
A library of special functions software is maintained. Questions of accuracy, desirability and compatibility are addressed. G.L.C.

N85-22034# Argonne National Lab., Ill.
PARALLEL LINEAR ALGEBRA LIBRARY FOR THE DENELCOR HEP
J. J. Dongarra and D. C. Sorensen Oct. 1984 22 p refs
(Contract W-31-109-eng-38)
(DE85-004685; ANL/MCS-TM-33) Avail: NTIS HC A02/MF A01
The implementation of a library of algorithms for problems in linear algebra on the Denelcor HEP is discussed. The package includes some of the most heavily used subroutines from LINPACK, that is, solution of linear systems based on LU, Cholesky, and OR factorizations as well as the appropriate triangular solvers. The concept followed is to code these routines in terms of high-level modules, which provides a vehicle to achieve both transportability and efficiency across a wide range of architectures. This concept is discussed in the conext of a numerical linear algebra software library which is adaptable to highly parallel computing systems. The concept is expected to applicable to other libraries as well. DOE

N85-22035# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Wolkenphysik.
PROGRAMS FOR DYNAMIC LOADING OF PRECOMPILED SUBROUTINE PACKAGES, ESPECIALLY FOR APPLICATIONS WITH THE WATFIV COMPILER
Thomas Jank Oct. 1984 67 p In GERMAN; ENGLISH summary
(DFVLR-Mitt-84-18; ISSN-0176-7739) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23
Programs which allow loading of dynamically precompiled subroutine packages and selection of arbitrary routines for execution are described. The routines comply with the IBM Standard Link Conventions. The programs are called by Fortran routines, running under the control of the Watfiv compiler. They allow the execution of precompiled routines available as object or as load modules. The package improves program development possibilities, and cuts operating costs and programming work. Author (ESA)

N85-22036# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A PROPOSAL FOR STANDARD BASIC FUNCTIONS IN ADA
J. Kok and G. T. Symm (National Physical Lab., Teddington, England) Jun. 1984 13 p refs Submitted for publication
(CWI-NM-R8407; B8475632) Avail: NTIS HC A02/MF A01
Specifications for a standard basic mathematical functions package for scientific computation in Ada are proposed. The package is transportable to machines with different floating-point types and its availability enhances the portability of numerical software. Author (ESA)

N85-22037# Federal Compiler Testing Center, Falls Church, Va.
RYAN-McFARLAND CORPORATION, IBM PC MODEL XT, RM/FORTRAN, VERSION 2.0.0 Validation Summary Report
20 Aug. 1984 12 p
(PB85-107993; OIT/FSTC-84/215) Avail: NTIS HC A02/MF A01 CSCL 09B
This Validation Summary Report (VSR) for the Ryan-McFarland Corporation, RM/FORTRAN Version 2.0.0 running under the PC DOSA Version 2.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSF is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-22038# Federal Compiler Testing Center, Falls Church, Va.
RYAN McFARLAND CORPORATION, SUN MICROSYSTEM WITH SKY FAST FLOATING POINT PROCESSOR, RM/FORTRAN VERSION 1.5.0 Validation Summary Report
20 Aug. 1984 12 p
(PB85-108009; OIT/FSTC-84/216) Avail: NTIS HC A02/MF A01 CSCL 09B
This Validation Summary Report (VSR) for the Ryan-McFarland Corporation RM/FORTRAN Version 1.5.0 running under the SUN UNX Version 4.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the August 20, 1984 level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-22039# National Bureau of Standards, Gaithersburg, Md. Center for Programming Science and Technology.
SELECTION AND USE OF GENERAL-PURPOSE PROGRAMMING-LANGUAGE: PROGRAM EXAMPLES, VOLUME 2 Final Report
J. V. Cugini Oct. 1984 185 p refs
(PB85-122000; NBS/SP-500/117/2-Vol-2; LC-84-601120) Avail: NTIS HC A09/MF A01; SOD HC as SN003-003-02613-1 CSCL 09B
Given that conventional programming is the appropriate technique for a particular application, the choice among the various languages becomes an important issue. A survey of selection factors for the major general-purpose languages Ada, BASIC, C, COBOL, FORTRAN, Pascal, and PL/I is presented. The factors covered include not only the logical operations within each language, but also the advantages and disadvantages stemming from the current computing environment, e.g., software packages, microcomputers, and standards. Finally, there is a set of program examples to illustrate the features of the various languages. GRA

N85-22040# National Bureau of Standards, Gaithersburg, Md. Center for Programming Science and Technology.
SELECTION AND USE OF GENERAL-PURPOSE PROGRAMMING LANGUAGE: OVERVIEW, VOLUME 1 Final Report
J. V. Cugini Oct. 1984 82 p refs
(PB85-122018; NBS/SP-500/117/1-Vol-1; LC-84-601119) Avail: NTIS HC A04/MF A01; SOD HC as SN003-003-026123 CSCL 09B
A survey of selection factors for the major general-purpose languages Ada, BASIC, C, COBOL, FORTRAN, Pascal, and PL/I is presented. The factors covered include not only the logical operations within each language, but also the advantages and disadvantages stemming from the current computing environment, e.g., software packages, microcomputers, and standards. The criteria associated with the application and the user's facilities are explained. GRA

N85-22041# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
SIMULA: DIGITAL CONTROLLER SIMULATION PACKAGE

L. K. Lauderbaugh and A. G. Ulsoy Mar. 1984 101 p
(Grant NSF MEA-81-12629)
(PB85-134492; NSF/MEA-84008; UM-MEAM-84-22) Avail: NTIS HC A06/MF A01 CSCL 09B

The SIMULA digital controller simulation package, which is written in FORTRAN and runs under the RT-11 operating system on an SL1-11/23 minicomputer system is described. The program simulates the direct digital control (DDC) of a continuous time plant. The DDC is discussed, and information on problem formulation is supplied. Ways of putting the correctly formulated problem into the user supplied subroutines are noted, and more advanced options available in the user supplied routines are explored. The RT-11 commands required to run the program are presented, and information on data output is included. Also provided is an example of a controller design for a first order system. The appendices contain installation notes, listings of the user supplied routine for the example, and listings of the source code. GRA

N85-22042# Indiana Univ., Bloomington. Center for Transit Research and Management Development.
MICROCOMPUTERS IN TRANSIT: A SOFTWARE HANDBOOK Final Report
Eve Wyatt and George Smerk Jul. 1984 189 p refs
(PB85-136414; UMTA-IN-11-0009-84-2) Avail: NTIS HC A10/MF A01 CSCL 09B

The types of computer programs used in the transit industry are described. Also discussed are generic software, application software programs, operating systems, programming languages and utility programs. B.G.

N85-21557# Joint Publications Research Service, Arlington, Va.
REDUNDANCY OF CODES FOR DETECTION AND CORRECTION OF UNIDIRECTIONAL ERRORS Abstract Only
G. A. Borodin, A. K. Stolyarov, and V., A. Ivanov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 33 Transl. into ENGLISH from Radiotekhnika (USSR), no. 10, Oct. 1984 p 63-65 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-22240*# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
EVALUATION OF PHOENICS AS A DESIGN ANALYSIS TOOL FOR SSME
M. B. Ventrice *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 28p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N85-22043# Naval Postgraduate School, Monterey, Calif.
A FORMAL METHOD FOR SPECIFYING COMPUTER RESOURCES IN AN IMPLEMENTATION INDEPENDENT MANNER
D. Davis Nov. 1984 38 p
(AD-A149955; NPS52-84-022) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper is an investigation of a methodology for the formal specification of computer software or hardware resource interfaces. The objective of the methodology is to make possible the specification of implementation independent, and thus portable, interfaces for the development of software. This paper is concerned with the theoretical and conceptual issues of such a specification methodology, and for the most part is an adaptation of the methods of algebraic specification of data types to the specification of computer resources. This paper is the basis for a practical specification in progress. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N85-22044*# Pattern Analysis and Recognition Corp., McLean, Va. Geographic Systems Section.
TECHNICAL SUPPORT FOR CREATING AN ARTIFICIAL INTELLIGENCE SYSTEM FOR FEATURE EXTRACTION AND EXPERIMENTAL DESIGN Final Report
Barry J. Glick [1985] 28 p refs
(Contract NAS5-28117)
(NASA-CR-175286; NAS 1.26:175286) Avail: NTIS HC A03/MF A01 CSCL 09B

Techniques for classifying objects into groups or clases go under many different names including, most commonly, cluster analysis. Mathematically, the general problem is to find a best mapping of objects into an index set consisting of class identifiers. When an a priori grouping of objects exists, the process of deriving the classification rules from samples of classified objects is known as discrimination. When such rules are applied to objects of unknown class, the process is denoted classification. The specific problem addressed involves the group classification of a set of objects that are each associated with a series of measurements (ratio, interval, ordinal, or nominal levels of measurement). Each measurement produces one variable in a multidimensional variable space. Cluster analysis techniques are reviewed and methods for incuding geographic location, distance measures, and spatial pattern (distribution) as parameters in clustering are examined. For the case of patterning, measures of spatial autocorrelation are discussed in terms of the kind of data (nominal, ordinal, or interval scaled) to which they may be applied. M.G.

N85-22045# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
LEARNING TO SEARCH. FROM WEAK METHODS TO DOMAIN-SPECIFIC HEURISTICS Interim Technical Report
P. Langley 1 Sep. 1984 12 p
(AD-A149949; CMU-RI-TR-84-21) Avail: NTIS HC A02/MF A01 CSCL 05/10

Learning from experience involves three distinct components generating behavior, assigning credit, and modifying behavior. This document discusses these components in the context of learning search heuristics, along with the types of learning that can occur. The author then focus on SAGE, a system that improves its search strategies with practice. The program is implemented as a production system, and learns by creating and strengthening rules for proposing moves. SAGE incorporates five different heuristics for assigning credit and blame, and employs a discrimination process to direct its search through the space of rules. The system has shown its generality by learning heuristics for directing search in six different task domains. In addition to improving its search behavior on practice problems, SAGE is able to transfer its expertise to scaled-up versions of a task, and in one case transfers its acquired search strategy to problems with different initial and goal states. GRA

N85-22046# Columbia Univ., New York. Dept. of Mechanical Engineering.
PRACTICAL CONSIDERATIONS FOR NONINTERACTING CONTROL SYNTHESIS Final Report, 1 Oct. 1983 - 30 Sep. 1984
George Klein 30 Oct. 1984 4 p
(Grant AF-AFOSR-0245-82; AF Proj. 2304)
(AD-A150130; AFOSR-84-1269TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

The research was concerned with the practical problems of achieving noninteracting control (decoupling). This problem involves finding a feedback controller so that each input of a system affects one and only one output of the closed-loop system and maintains this behavior even in the presence of small modelling errors. This research then led to the investigation of the problem of determining the freedom in assigning eigenstructures when the closed-loop

system has repeated eigenvalues. The research results for the problem of noninteracting control has led to a characterization of the closed-loop eigenstructure of decoupled systems. The results of the investigation of the second problem has led to a complete characterization and better understanding of the minimum time control of discrete time systems, better known as deadbeat control systems. GRA

N85-22047# Los Alamos Scientific Lab., N. Mex. Computer User Services.
CHARACTERIZING THE PARALLELISM IN RULE-BASED EXPERT SYSTEMS
Robert J. Douglass 1984 19 p refs Presented at the Intern. Conf. on Systems Sci., Honolulu, Hi., 1 Jan. 1985
(Contract W-7405-eng-36)
(DE85-002432; LA-UR-84-3428; CONF-850131-1) Avail: NTIS HC A02/MF A01

Two classes of rule-based expert systems are reviewed and potential sources of parallelism at the production or rule level, the subrule level (including match, select, and act parallelism), and at the search level (including AND, OR, and stream parallelism) are analyzed. The potential amount of parallelism from each source is discussed and characterized in terms of its granularity, inherent serial constraints, efficiency, speedup, dynamic behavior, communication volume, frequency, and topology. Subrule parallelism will yield two to ten fold speedup, and rule level parallelism will yield a modest speedup on the order of five to ten times. Rule level can be combined with OR, AND, and stream parallelism in many instances to yield further parallel speedups. DOE

N85-21561# Joint Publications Research Service, Arlington, Va.
CONTROL OF NONLINEAR OBJECTS Abstract Only
Oleg Pavlovich Ilin and Petr Pavlovich Primshits *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 37 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Electromekhanika (USSR), no. 10, Oct. 1984 p 68-73 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21562# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF DIGITAL CONTROL FOR OBJECT WITH LAG Abstract Only
Vitality Yakovlevich rotach and Anatoliy Romanovich Gayduk *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 38 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 58-64 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-22229*# Alabama Univ., Birmingham. Dept. of Computer and Information Science.
EVALUATION OF EXPERT SYSTEMS
Michael A. McAnulty *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 20p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 09B

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-22048 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
THE PERFORMANCE OF A TYPE-INSENSITIVE RUNGE-KUTTA CODE ON A PERSONAL COMPUTER
Peter Rentrop Jul. 1984 17 p refs
(TUM-I8410) Copyright. Avail: Issuing Activity

It is shown that the combination of the stepsize comparison test and the norm test of the Jacobian leads to a type-insensitive algorithm, which switches automatically between different stiff and nonstiff phases. The code was successfully implemented and tested on the personal computer PAX. Computing times of 10 min for an example of STIFF DETEST show that personal computers can be used for the numerical solution of small systems of differential equations with low tolerance requirements.
Author (ESA)

N85-22049*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RECOVERING POINTWISE VALUES OF DISCONTINUOUS DATA WITHIN SPECTRAL ACCURACY Final Report
David Gottlieb and Eitan Tadmor Jan. 1985 22 p refs
(Contract NAS1-17070; Grant AF-AFOSR-83-0089)
(NASA-CR-172535; ICASE-85-3; NAS 1.26:172535) Avail: NTIS HC A02/MF A01 CSCL 12A

The pointwise values of a function, f(x), can be accurately recovered either from its spectral or pseudospectral approximations, so that the accuracy solely depends on the local smoothness of f in the neighborhood of the point x. Most notably, given the equidistant function grid values, its intermediate point values are recovered within spectral accuracy, despite the possible presence of discontinuities scattered in the domain. (Recall that the usual spectral convergence rate decelerates otherwise to first order, throughout). To this end, a highly oscillatory smoothing kernel is employed in contrast to the more standard positive unit-mass mollifiers. In particular, post-processing of a stable Fourier method applied to hyperbolic equations with discontinuous data, recovers the exact solution modulo a spectrally small error. Numerical examples are presented. Author

N85-22050*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE ACCURACY OF LEAST SQUARES METHODS IN THE PRESENCE OF CORNER SINGULARITIES Final Report
C. L. Cox and G. J. Fix Feb. 1985 28 p refs
(Contract NAS1-17070)
(NASA-CR-172552; ICASE-85-15; NAS 1.26:172552) Avail: NTIS HC A03/MF A01 CSCL 12A

Elliptic problems with corner singularities are discussed. Finite element approximations based on variational principles of the least squares type tend to display poor convergence properties in such contexts. Moreover, mesh refinement or the use of special singular elements do not appreciably improve matters. It is shown that if the least squares formulation is done in appropriately weighted space, then optimal convergence results in unweighted spaces like L(2). M.G.

N85-22051*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DIFFERENTIATING MATRICES FOR ARBITRARILY SPACED GRID POINTS Final Report
W. D. Lakin Jan. 1985 26 p refs
(Contract NAS1-17070)
(NASA-CR-172556; ICASE-85-5; NAS 1.26:172556) Avail: NTIS HC A03/MF A01 CSCL 12A

Differentiating matrices allow the numerical differentiation of functions defined at points of a discrete grid. A type of differentiating matrix based on local approximation on a sequence of sliding subgrids is considered. Previous derivations of this type of matrix have been restricted to grids with uniformly spaced points, and the resulting derivative approximations have lacked precision, especially at endpoints. The new formulation allows grids which have arbitrarily space points. It is shown that high accuracy can be achieved through use of differentiating matrices on non-uniform grids which include near-boundary points. Use of the differentiating matrix as an operator to solve eigenvalue problems involving ordinary differential equations is also considered. M.G.

N85-22052# Los Alamos Scientific Lab., N. Mex.
NUMERICAL METHODS FOR TRACKING INTERFACES
James M. Hyman Mar. 1984 24 p refs
(Contract W-7405-eng-36)
(LA-9917-MS) Avail: NTIS HC A03/MF A01

Special numerical methods for tracking discontinuous fronts and interfaces are reviewed. These methods include surface tracking methods based on connected marker points along the inteface, volume tracking methods that track the volume occupied by the solution regions bounded by the interfaces, and moving-mesh methods where the underlying mesh is aligned and moved with the interface. The pros and cons of the current methods are discussed, and a method is proposed that overcomes some of the difficulties encountered in approximating equations with multiple interacting interfaces. M.G.

N85-22053# Loughborough Univ. of Technology (England). Dept. of Mathematics.
A NOTE ON THE USE OF POLYNOMIAL TRANSFORMATIONS IN EVALUATING SINGULAR INTEGRALS
G. A. Evans, R. C. Forbes, and J. Hyslop Jun. 1982 22 p refs (Mathematics-Research-165) Avail: NTIS HC A02/MF A01

It is shown that simple polynomial changes of variable when used in conjunction with the progressive quadrature method of Patterson are extremely efficient in alleviating a wide class of commonly occurring singularities. Accurate values of the singular integrals involved are obtainable with a highly economic number of quadrature grid points. The results of extensive numerical tests are presented. Author

N85-22054# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE IMPLEMENTATION OF THE TANH TRANSFORMATIONS IN THE EVALUATION OF SINGULAR INTEGRALS
G. A. Evans, R. C. Forbes, and J. Hyslop Feb. 1983 29 p refs (Mathematics-Research-171) Avail: NTIS HC A03/MF A01

Some modifications of the well-known tanh transformation of Schwartz are considered and their efficient implementation in the evaluation of singular integrals is investigated. Schwartz's prescription for the optimization of the interval width and subsequent error estimation is discussed and extended. An alternative progressive automatic routine is also presented. Extensive tests are carried out and comparisons made with earlier methods. Author

N85-22055# North Carolina Univ., Chapel Hill. Dept. of Statistics.
METHODS OF PROGRESSING WAVES IN TURBULENT MEDIA WITH APPLICATIONS TO ACOUSTICS
P. L. Chow Sep. 1984 41 p Prepared in cooperation with Wayne State Univ., Detroit, MI, Contract DAAG29-83-K-0014. Presented at the Conference, Modern Development in Applied Mathematics, Northwestern Univ.
(Contracts N00014-81-K-0373; N00014-75-C-0491)
(AD-A149599; LISS-10) Avail: NTIS HC A03/MF A01 CSCL 12/1

A method of constructing progressing wave solutions is introduced for treating random linear hyperbolic systems which govern the wave propagation in turbulent media. The method is based on the sample-path asymptotic solution, the diffusion approximation for the characteristic equations, and the Wiener-functional integrals. It is then applied to some problems concerning acoustic waves in turbulent media. GRA

N85-22056# North Carolina Univ., Chapel Hill. Dept. of Statistics.
AN ASYMPTOTICALLY EFFICIENT SOLUTION TO THE BAND-WIDTH PROBLEM OF KERNEL DENSITY ESTIMATION, REVISION
J. S. Marron Apr. 1984 31 p
(Contract N00014-81-K-0373)
(AD-A149600; MIMEO-SER-1545) Avail: NTIS HC A03/MF A01 CSCL 12/1

A data-driven method of choosing the bandwidth, h, of a kernel density estimator is proposed. It is seen that this means of selecting h is asymptotically equivalent to taken the h that minimizes a certain weighted version of the mean integrated square error. Thus, for a given kernel function, the bandwidth can be chosen optimally without making precise smoothness assumptions on the underlying density. The proposed technique is a modification of cross-validation. GRA

N85-22057# Wisconsin Univ., Madison. Mathematics Research Center.
LOCAL BEHAVIOR OF SOLUTIONS OF AN ELLIPTIC-PARABOLIC EQUATION Technical Summary Report
E. DiBenedetto and R. Gariepy Sep. 1984 30 p
(Contract DAAG29-80-C-0041)
(AD-A149624; MRC-TSR-2747) Avail: NTIS HC A03/MF A01 CSCL 12/1

Consideration of the nonsteady filtration of an incompressible fluid in a homogeneous, partially saturated, porous medium leads to a degenerate nonlinear parabolic equation which is of elliptic type in the space variables in the region of degeneracy, i.e., in the saturated region. Results concerning the existence of weak solutions of such equations have been established. Here the local properties of weak solutions are studied. In particular it is shown that under the realistic assumption that the hydrostatic potential is bounded, the solution (moisture content) can be defined pointwise and is continuous. (Author). GRA

N85-22058# Wisconsin Univ., Madison. Mathematics Research Center.
A METHOD OF CALCULATING PERIODIC SOLUTIONS OF SECOND ORDER DYNAMICAL SYSTEMS Technical Summary Report
A. Eydeland Nov. 1984 30 p
(Contract DAAG29-80-C-0041; Grants NSF DMS-82-10950; NSF MCS-83-01628)
(AD-A149634; MRC-TSR-2768) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this work several numerical procedures for finding periodic solutions of Hamiltonian systems with Hamiltonian H(p,q) = sq p + V(q) are considered. The original system of equations is replaced by a constrained variational problem. Numerical procedures are constructed by using the method of transformation of the objective functional applied to this variational problem. Global convergence results are established and different aspects of numerical implementation of the method are discussed. Additional keywords included: nonlinear variational problem, constrained variational problem, nonlinear eigenvalue problem. GRA

N85-22059# Columbia Univ., New York. Dept. of Mathematics.
NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS AND RELATED PROBLEMS OF PADE APPROXIMATIONS Interim Report, 30 Jun. 1983 - 29 Jun. 1984
D. V. Chudnovsky and G. V. Chudnovsky Nov. 1984 5 p
(Grant AF-AFOSR-0190-81)
(AD-A149650; AFOSR-84-1180TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period the two investigators produced more than six papers with titles including, The Wronskian formalism for linear differential equations and Pade approximations, On some applications of diophantine approximations, Recurrences, Pade approximations and their applications, Note on theta functions and S matrices, and Pade approximations to solutions of linear differential equations and applications to diophantine analysis. GRA

N85-22060# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
MAXIMUM MATCHINGS IN A CLASS OF RANDOM GRAPHS
A. M. Frieze Jan. 1984 23 p
(Contract N00014-75-C-0621)
(AD-A149663; AD-E450012) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is concerned with graphs which suffice as an approximate model of a sparse random graph with a lower bound of m on the vertex degrees. GRA

N85-22061# Washington Univ., Seattle. Dept. of Statistics.
ORDINARY AND PROPER LOCATION M-ESTIMATES FOR ARMA MODELS, REVISED

C. H. Lee and R. D. Martin Jul. 1984 37 p
(Contract N00014-84-C-0169)
(AD-A149705; TR-29-Rev) Avail: NTIS HC A03/MF A01 CSCL 12/1

Proper location M-estimates for a model with non-Gaussian autoregressive-moving average type errors are genuine maximum likelihood type estimates, whereas ordinary location M-estimates are those introduced by P. Huber for independent and identically distributed errors. The relative behavior of ordinary location M-estimates and proper location M-estimates is studied for situations with dependent errors of purely autoregressive and purely moving average type. It is shown through asymptotic calculations and finite-sample size Monte Carlo studies that although ordinary location M-estimates are adequate for weak dependency structure, they can be quite inefficient compared with proper M-estimates of location when the non-Gaussian errors have a moderate to strong dependency structure. Author (GRA)

N85-22062# Stanford Univ., Calif. Dept. of Statistics.
TESTS OF FIT BASED ON NORMALIZED SPACINGS
R. A. Lockhart, F. J. OReilly, and M. A. Stephens 27 Dec. 1984 27 p
(Contract N00014-76-C-0475)
(AD-A149749; SU-TR-352) Avail: NTIS HC A03/MF A01 CSCL 12/1

Normalized spacings provide useful tests of fit for many suitably regular continuous distributions; attractive features of the tests are that they can be used with unknown parameters and also with samples which are censored (Type 2) on the left and/or right. A transformation of the spacings leads, under the null hypothesis, to a set of z-values in 0,1; these are not however, uniformly distributed except for spacings from the exponential or uniform distributions. Statistics based on the mean or the median of the z-values have already been suggested for tests for the Weibull (or equivalently the extreme value) distribution; we now add the Anderson-Darling statistic. Asymptotic theory of the test statistics is given in general, and specialized to the normal, logistic and extreme-value distributions. Monte Carlo results show the asymptotic points can be used for relatively small samples. Also, a Monte Carlo study on power of the normal tests is given, which shows the Anderson-Darling statistic to be powerful against a wide range of alternatives; it is possible for the mean and median to be not consistent and even biased. GRA

N85-22063# Maryland Univ., College Park.
DETERMINING CONDUCTIVITY BY BOUNDARY MEASUREMENTS. PART 2: INTERIOR RESULTS Final Report
R. V. Kohn (New York Univ., N.Y) and M. Vogelius Oct. 1984 43 p 2 Vol.
(Contracts N00014-77-C-0623; N00014-83-K-0536; Grant NSF DMS-83-12229)
(AD-A149750; BN-1028) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a recent paper the authors showed that an unknown real-analytic conductivity gamma may be determined from static boundary measurements. In this document they extend this analysis by demonstrating that a similar result holds for piecewise real-analytic conductivities. In addition, for the special case of a layered structure it is shown that a three times continuously differentiable conductivity is identifiable by boundary measurements. GRA

N85-22064# Maryland Univ., College Park. Center for Automation Research.
PARALLEL PROCESSING OF ENCODED BIT STRINGS
A. Y. Wu Nov. 1984 26 p
(Contract F49620-83-C-0082)
(AD-A149812; CAR-TR-98; CS-TR-1455; AFOSR-84-1181TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Many operations on strings of length n can be speeded up by a factor of p using p processors. String operations can also be speeded up, even when a single processor is used, by compactly encoding the strings, e.g., using run length code. This paper shows how to combine these two approaches by using p processors to process compactly encoded strings. The author studies various representations of bit strings and parallel algorithms to process these representations using a multiprocessor system. Section 2 describes the parallel processing model used. Sections 3 and 4 discuss various compact representations of strings, and their conversions to each other. Section 5 presents algorithms to process run length coded strings. Section 6 briefly discusses the extension of this work to representations of two-dimensional objects. Additional keywords included: message processing, computations, binary arithmetic, coding, coordinates, value. GRA

N85-22065# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
ON THE LIMITING EMPIRICAL DISTRIBUTION FUNCTION OF THE EIGENVALUES OF A MULTIVARIATE F MATRIX
Z. D. Bai, Y. Q. Yin, and P. R. Krishnaiah Oct. 1984 17 p
(Contract F49620-82-K-0001)
(AD-A149818; TR-84-42; AFOSR-84-1215TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, the authors derived an explicit expression for the limit of the empirical distribution function of a central multivariate F matrix when the number of variables and degrees of freedom tend to infinity in certain fashion. This distribution is useful in deriving the limiting distributions of certain test statistics which arise in multivariate analysis of variance, canonical correlation analysis and tests for the equality of two covariance matrices. Originator-supplied key words included: Large dimensional random matrices, Wishart matrices, Computations, Air Force research. Author (GRA)

N85-22066# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
AN ASYMPTOTICALLY OPTIMAL SUBCLASS OF BTIB DESIGNS FOR COMPARISONS WITH A CONTROL
J. D. Spurrier and D. Edwards Oct. 1984 28 p
(Grant AF-AFOSR-0156-84)
(AD-A149819; TR-98R; AFOSR-84-1200TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Incomplete block designs for estimation of treatment-control differences are studied. A class of designs for this purpose, called balanced treatment incomplete block designs, has recently been proposed and studied by several authors. Here, a relatively small subclass of these designs is shown to contain the asymptotically optimal design under the criterion of minimizing the length of simultaneous confidence intervals for treatment-control differences. These results can be used to easily construct good large designs. Some specific finite cases are considered. Originator-supplied key words included: Multivariate distribution, Allocations, Air Force research. Author (GRA)

N85-22067# California Univ., San Diego.
A TWO-DIMENSIONAL SMOOTHING SPLINE AND A REGRESSION PROBLEM
M. Rosenblatt 1984 18 p
(Contract N00014-81-K-0003)
(AD-A149824) Avail: NTIS HC A02/MF A01 CSCL 12/1

A two-dimensional analogue of a smoothing spline problem is considered. It is shown how boundary effects can arise here even in the case of periodicity. Additional keywords included: Naval research, Fourier analysis, Coefficients, Approximation (Mathematics). GRA

N85-22068# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
DISTRIBUTED ASYNCHRONOUS DETERMINISTIC AND STOCHASTIC GRADIENT OPTIMIZATION ALGORITHMS: REVISION
J. N. Tsitsiklis, D. P. Bertsekas, and M. Athans Nov. 1984 50 p
(Contract N00014-77-C-0532; Grant NSF ECS-82-17668)
(AD-A149997; LIDS-P-1425) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents a model for asynchronous distributed computation and then proceeds to analyze the convergence of

natural asynchronous distributed versions of a large class of deterministic and stochastic gradient-like algorithms. It is shown that such algorithms retain the desirable convergence properties of their centralized counterparts, provided that the time between consecutive communications and between processors and communication delays are not too large. Author (GRA)

N85-22069# Army Armament Munitions and Chemical Command, Rock Island, Ill. Readiness Directorate.
STATISTICS FOR THE MAXIMUM OF SEVERAL POSITIVE RANDOM VARIABLES WITH APPLICATION TO NETWORKING Final Report
G. J. Schlenker Dec. 1984 83 p
(AD-A150005; AMSMC/RD/MR-5) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report addresses a common problem in activity networks, popularly known as Program Evaluation and Review Technique (PERT) networks. This is the problem of calculating statistics associated with the maximum of several parallel, random activity times. Generally, one desires the mean, standard deviations, and quantiles of the distribution of the maximum of a set of positive, continuous, and independent random variables. An accurate recursive numerical algorithm for calculating these statistics is presented here. This method is somewhat more efficient than more straightforward numerical techniques. The method developed and used here is not restricted by having all of the random variables belong to the same distribution or even by having the same functional form. Pertinent, general formulas are derived as well as some closed-form results for a special case. Numerical examples are presented to assess the method's computational error and to illustrate certain quantitative generalizations. Although not limited to activity network applications, these results and the enclosed computer programs can be used to assess the estimation errors associated with deterministic networking methods such as PERT and CPM. GRA

N85-22070# Stanford Univ., Calif. Dept. of Operations Research.
RECURSIVE MOMENT FORMULAS FOR REGENERATIVE SIMULATION
Peter W. Glynn (Wisconsin Univ.) and Donald L. Iglehart Oct. 1984 15 p
(Contract DAAG29-84-K-0030; Grant NSF MCS-82-03483)
(AD-A150112; TR-5; ARO-20927.5-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let an expression be a regenerative semi-Markov process with countable state space E and f a real-valued function on E. This paper gives a recursive method for computing moments. These moments are needed to improve the accuracy of confidence intervals for steady state parameters obtained when using the method of regenerative simulation. Originator-supplied keywords include: Regenerative simulation, Semi-Markov process, Recursive moment formulas. GRA

N85-22071# California Univ., Berkeley.
NONLINEAR SIGMA-MODELS AND INTEGRATION METHODS
E. Ntagwirumugara Nov. 1984 12 p refs
(Contract DE-AC03-76SF-00098)
(DE85-004447; LBL-18634) Avail: NTIS HC A02/MF A01

Generally speaking, the nonlinear sigma models (or chiral models) are scalar fields, subject to a nonlinear constraint causing them to take values within a homogeneous subspace G/H of a global symmetry group G. Two integration methods - the inverse scattering problem methods and the Baecklund transformations - for the U(n) principle sigma models are reviewed. M.G.

N85-22072# Los Alamos Scientific Lab., N. Mex.
LOW-DIMENSIONAL BEHAVIOR OF THE PATTERN FORMATION CAHN-HILLIARD EQUATION
B. Nicolaenko and B. Scheurer (CEA Centre d'Etudes de Limeil) 1984 15 p refs Presented at the 6th Intern. Conf. on Trends in the Theory and Practice of Nonlinear Anal., Dallas, 18 Jun. 1984
(Contract W-7405-eng-36)
(DE85-003727; LA-UR-84-3522; CONF-8406225-1) Avail: NTIS HC A02/MF A01

The fourth-order Cahn-Hilliard parabolic partial differential equation which describes pattern formation in phase transition is investigated. Neumann and periodic boundary conditions are considered for a domain in R sup n, 1 < or = n < or = 3. This equation is characteized by a negative (backward) second order diffusion and multiple steady states for the appropriate range of parameters. It is demonstrated that the Cahn-Hilliard equation admits an intrinsic low dimensional behavior: in R(1), the number of determining modes (in a Galerkin expansion) is proportional to L/sup 3/2/; where L, the diameter of the domain, is also proportional to the number of unstable modes for the linearized equation. Similar results hold for n = 2,3. DOE

N85-22073# Stanford Univ., Calif. Systems Optimization Lab.
DIRECT SECANT UPDATES OF SPARSE MATRIX FACTORS
F. Chadee Sep. 1984 58 p refs
(Contract DE-AT03-76ER-72018)
(DE85-004008; SU-SOL-84-5) Avail: NTIS HC A04/MF A01

Quasi-Newton methods for the solution of large sparse systems of non-linear equations suffer two disadvantages versus quasi-Newton methods for small systems. They require a matrix factorization on each iterate and also need to maintain in storage both the Jacobian approximation and its factors at the same time. Two updating techniques, which are applied directly to the factors of the matrix approximation and which attempt to remove these two disadvantages, are discussed here. A theoretical analysis of local Q-superlinear convergence is presented. DOE

N85-22074# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
HARMONIC ANALYSIS AND RADON TRANSFORMS ON PENCILS OF GEODESICS
E. Badertscher (Bern University) Oct. 1984 25 p refs Submitted for publication
(CWI-PM-R8413; B8478830) Avail: NTIS HC A02/MF A01

Pencils of geodesics are introduced as generalized points in classical geometries X. The spherical harmonic analysis on X is generalized to pencils (particularly spherical functions and spherical Fourier transforms on pencils). By means of Radon transforms (i.e., by changing the invariance type of a function through integration) the theories on different pencils can be related. By evaluating the Radon transforms of spherical functions product formules are obtained. Where X = a hyperbolic n-space (Hn) the spherical functions can be expressed by Jacobi functions, and the Radon transforms can be reduced to fractional integral transforms. A Radon transform transfers the convolution structure from K-invariant functions on Hn to H-invariant functions on Hn (K = S0(n), H = S0 sub 0 (1, n-1)). Author (ESA)

N85-22075# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
LOCAL SEARCH IN ROUTING PROBLEMS WITH TIME WINDOWS
M. W. P. Savelsburgh Jul. 1984 17 p refs Submitted for publication
(Grant STW-CWI-22.0348)
(CWI-OS-R8409; B8478780) Avail: NTIS HC A02/MF A01

Local search algorithms for routing problems with time windows, based on the k-interchange concept are presented. The presence of time windows introduces feasibility constraints, the checking of which normally requires 0(N) time. The method reduces this checking effort to 0(1) time. The problem of finding initial solutions is considered. A complexity result is given and an insertion heuristic is described. Author (ESA)

N85-22076# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
CONVERGENCE RATES IN THE STRONG LAW FOR BOUNDED MIXING SEQUENCES
H. C. P. Berbee Sep. 1984 20 p refs Submitted for publication

(CWI-MS-R8412; B8478782) Avail: NTIS HC A02/MF A01

Speed of convergence for Marcinkiewicz-Zygmund strong law for partial sums of bounded dependent random variables is studied under conditions on their mixing rate. Both a-mixing and absolutely regular sequences are considered. The results are applied to renewal theory to show that estimates obtained there by coupling are the best possible. Another application sharpens a results for averaging a function along a random walk. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-22077# Loughborough Univ. of Technology (England). Dept. of Mathematics.

PREDICTING A FUTURE RESPONSE USING RANK PREDICTIVE PROBABILITIES

B. Serpil Acar and A. N. Pettitt Aug. 1982 42 p refs

(Mathematics-Research-166) Avail: NTIS HC A03/MF A01

Given a vague or partly unspecified relationship between a response variable and an explanatory variable, the problem of predicting a future response is considered. A technique based on the ranks of observations is introduced which uses an approximation to a marginal likelihood of ranks to find predictive probabilities for a future response. The predictive probabilities are defined in terms of the spacings of the order statistics of the sample of responses. Various estimates of the future response based on these probabilities, are considered. Monte Carlo experiments were carried out to compare these new estimates with existing estimates, based on ranks, using isotonic regression and parametric estimates based on Box - Cox transformations. The new estimates perform well. M.G.

N85-22078# Loughborough Univ. of Technology (England). Dept. of Mathematics.

INFERENCE FOR CENSORED MATCHED PAIRS USING SIGNED RANKS

A. N. Pettitt Mar. 1982 18 p refs

(Mathematics-Research-162) Avail: NTIS HC A02/MF A01

Using the marginal likelihood based on the signed ranks derived from matched pairs data, inferences are made for regression parameters. Both members of a given pair are subject to the same censoring time, while different pairs are subject to different censoring times. Censoring is independent of the response and on the right. Easily calculated logistic density scores are used to provide an approximate analysis so that inferences can be made about a regression parameter in the presence of a difference within the matched pairs. Inference for the survival times of matched skin grafts is considered. Author

N85-22079# Loughborough Univ. of Technology (England). Dept. of Mathematics.

SIMPLIFICATIONS AND APPROXIMATIONS FOR LINEAR RANK STATISTICS WITH CENSORED DATA

A. N. Pettitt Jan. 1982 20 p refs

(Mathematics-Research-161) Avail: NTIS HC A02/MF A01

Linear rank statistics which are derived as score statistics from a rank marginal likelihood are considered. It is argued that inference should be based upon the score statistic and the corresponding observed information, for then, in some sample outcomes with censored data, simplications are possible which mean the statistics can be calculated from uncensored versions. In particular, rank statistics for the two-sample problem and signed-ranks statistics are considered, for which approximations based on observed information are better than approximations based on expected information. Use is made of the Strong Likelihood Principle. Author

N85-22080# Loughborough Univ. of Technology (England).

PROPORTIONAL ODDS MODELS FOR SURVIVAL DATA AND ESTIMATES USING RANKS

A. N. Pettitt May 1983 19 p refs

(Mathematics-Research-172) Avail: NTIS HC A02/MF A01

Survival data are analyzed where it is assumed that the logrithm of the odds against survival beyond a certain time is equal to a linear term, involving covariances in a regression model, plus a function of time. It is shown that estimates for the regression parameters can be obtained by replacing survival times by their ranks. Comparisons are made with estimates found by Bennett (1983 a,b), who used the same model but different estimates. Author

N85-22081# Loughborough Univ. of Technology (England).

USE OF RANKS TO FIT A LINEAR MODEL TO CROSS-SECTIONAL DATA WITH AN APPLICATION TO BIOLOGICAL RHYTHMS

A. N. Pettitt Oct. 1982 19 p refs

(Mathematics-Research-169) Avail: NTIS HC A02/MF A01

Biological data are frequently collected with small numbers of observations from several subjects. Often a linear model is fitted to the data by averaging over subjects. Frequently there are considerable between subjects differences and due allowance should be made for this when fitting the model using parametric technique. It is proposed that the model can be fitted by using the within subject ranks of the observations. The technique is applied to the problem of estimating the 'cosinor' diagram for biological rhythm data. An example, involving melatonin levels, is considered where there are considerable between subjects differences. The results using the ranks are compared with a parametric anaysis which makes allowance for the between subjects differences. The results are very similar, however the rank analysis requires a far smaller amount of computation. M.G.

N85-22082# Washington Univ., Seattle. Dept. of Statistics.

A REVIEW OF SOME ASPECTS OF ROBUST INFERENCE FOR TIME SERIES Technical Report, 1 Jan. 1982 - 30 Nov. 1983

R. D. Martin Sep. 1984 38 p

(Contract N00014-84-C-0169)

(AD-A149706; TR-53) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper briefly surveys some aspects of robust inference for time series, and gives an indication of the current state of knowledge in other problem areas. Basic notions of robustness are stated, and technical difficulties associated with the time series case are mentioned. Some models for time series with outliers are given. Least-squares procedures lack robustness for such models and robust alternatives are described. Issues of adaptivity versus robustness are briefly mentioned. Robustness problems involving dependency are discussed. Algorithms for robust data smoother-cleaners are briefly described, along with an application to radar glint noise. Author (GRA)

N85-22083# Rice Univ., Houston, Tex. Dept. of Psychology.

A REPLICATION AND EXTENSION OF THE INDUCEMENT OF THE AVAILABILITY HEURISTIC

G. Fontenelle and W. C. Howell Dec. 1984 42 p

(Contract N00014-82-C-0001)

(AD-A149755; TR-84-5) Avail: NTIS HC A03/MF A01 CSCL 12/1

The availability of an event in an observer's memory is postulated to be one of the bases for estimates of its frequency of past occurrence or the probability of future occurrence. In a previous study, enhancing every occurrence of an event produced an overestimation of frequency and probability estimations and predictive choices. However, the general finding of overestimation held only for events at the low (3/225) and high (30/225) ends of the test range; in the middle range (12/225), judgments were fairly accurate. The present study sought to replicate the availability bias induced in the previous study and to explore the underlying cognitive processes by manipulating the conditions used to induce the bias. Author (GRA)

N85-22084# Illinois Univ., Chicago. Dept. of Quantitative Methods.

MULTI-SAMPLE CLUSTER ANALYSIS AS AN ALTERNATIVE

TO MULTIPLE COMPARISON PROCEDURES
H. Bozdogan 20 Jul. 1984 61 p
(Contract DAAG29-82-K-0155)
(AD-A149960; UIC/DQM/A84-3; ARO-19085.10-MA) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper studies multi-sample cluster analysis, the problem of grouping samples, as an alternative to multiple comparison procedures through the development and the introduction of model-selection criteria such as those: Akaike's Information Criterion (AIC) and Schwarz's Criterion (SC), as new procedures for comparing means, groups, or samples, and so forth, in identifying and selecting the homogeneous groups or samples from the heterogeneous ones in multi-sample data analysis problems. An enumerative clustering technique is presented to generate all possible choices of clustering alternatives of groups, or samples on the computer using efficient combinatorial algorithms without forcing an arbitrary choice among the clustering alternatives, and to find all sufficiently simple groups or samples consistent with the data and identify the best clustering among the alternative clusterings. Numerical examples are carried out and presented on a real data set on grouping the samples into fewer than K groups. Through a Monte Carlo study, an application of multi-sample cluster analysis is shown in designing optimal decision tree classifiers in reducing the dimensionality of remotely sensed heterogeneous data sets to achieve a parsimonious grouping of samples. The results obtained demonstrate the utility and versatility of model-selection criteria which avoid the notorious choice of levels of significance and which are free from the ambiguities inherent in the application of conventional hypothesis testing procedures. Author

N85-22085# Georgia Inst. of Tech., Atlanta. School of Psychology.
A NOTE ON VALIDITY GENERALIZATION PROCEDURES Interim Technical Report
Lawrence R. James, Robert G. Demaree, and Stanley A. Mulaik Jan. 1985 47 p
(Contract N00014-83-K-0480; NR Proj. 475-026)
(AD-A150065; GT-ONR-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

Validity generalization procedures are reviewed and found to be subject to the logical fallacy of affirming the consequent. Alternative models may explain variation in validity coefficients as well as the cross-situational consistency model espoused by proponents of validity generalization. Moreover, many of the assumptions that form the statistical foundation for validity generalization are false. It is recommended that: (1) the conditionality of inferences based on validity generalization analyses be explicitly stated; (2) the decision rule for the validity generalization ratio be changed from .75 to .90; and (3) validity generalization analyses employ Fisher z coefficients rather than (Pearson) correlation coefficients. GRA

N85-22086# Princeton Univ., N. J. Dept. of Statistics.
GENERAL SADDLEPOINT APPROXIMATIONS WITH APPLICATIONS TO L-STATISTICS
George S. Easton and Elvezio Ronchetti Sep. 1984 29 p
(Contracts DAAG29-82-K-0178; DE-ACO2-81ER1084)
(AD-A150073; TR-274-SER-2; ARO-19442.21-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

Saddlepoint approximations are extended to general statistics. The technique is applied to derive approximations to the density of linear combinations of order statistics, including trimmed means. A comparison with exact results shows the accuracy of these approximations even in very small sample sizes. Author (GRA)

N85-22087# Massachusetts Inst. of Tech., Cambridge. Center for Statistics.
ASYMPTOTICS FOR CONFIGURAL ESTIMATORS
Stephen Morgenthaler Sep. 1984 27 p
(Contract DAAG29-84-K-0207)
(AD-A150106; TR-1; ARO-21779.1-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper examines the asymptotic properties of compromise estimators. By this we mean an estimation method which compromises between a finite number of sampling situations in a small sample optimal way. We develop the asymptotic theory of such estimators and show that under a specific choice of sampling situations the compromise estimator is asymptotically robust in Huber's sense. Originator-supplied keywords include: Robust estimation, Conditional inference, Equivariance, Asymptotics. GRA

N85-22088# Hochschule der Bundeswehr, Munich (West Germany). Fachbereich Luft- und Raumfahrttechnik.
RATES OF CONVERGENCE OF SEMISTOCHASTIC APPROXIMATION PROCEDURES FOR SOLVING STOCHASTIC OPTIMIZATION PROBLEMS
Kurt Marti and Erich Fuchs Nov. 1984 40 p refs
Avail: NTIS HC A03/MF A01

A method for assessing the rate of convergence of a hybrid procedure for the minimization of a convex mean value function is outlined. The function, F(x) = Ef(x,w) is subject to (x pertainng to D) where D is a convex subset of R sup r, and f=f(x,w) is a random function function on R sup r. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-22089# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SYSTEMS VULNERABILITY AND LETHALITY IN THE DEVELOPMENT PHASE
D. F. Haskell 1984 13 p
(AD-A149737) Avail: NTIS HC A02/MF A01 CSCL 19/4

Vulnerability is a quantitative measure of the susceptibility of a target structure or material to a given damage mechanism - it is the characteristic of a target which describes its sensitivity to combat damage mechanisms. The systematic description, delineation and quantification of the vulnerability of the individual critical components and of the total target vulnerability is known as a vulnerability assessment. Certain elements of a vulnerability assessment are common to all analyses, regardless of the threat considered. The logic elements of such an assessment are: (1) definition of the problem; (2) an assembly of the physical and functional descriptions of the target; (3) description of the specific threats the target will encounter and their associated damage mechanisms (penetration, fire, etc.); (4) preparation of the target description; (5) identification of the critical components and determination of the target's damage-caused failure modes for the selected kill categories in terms of the critical components; (6) determination of the conditional probabilities of kill for each critical component and the single shot expected repair times for damaged components; and (7) computation of the vulnerability measures for the whole target based upon the selected threat. GRA

N85-22090# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
STATE DEPENDENT PRIORITY RULES FOR SCHEDULING Interim Report
A. P. J. Vepsalainen Jul. 1984 114 p
(Contract F49620-82-K-0017)
(AD-A149972; CMU-RI-TR-84-19) Avail: NTIS HC A06/MF A01 CSCL 12/2

The purpose of this thesis is to enhance the priority setting procedures for job shop scheduling systems. The new state dependent priority rules extend the concept of a myopic dispatching heuristic by allowing a wide choice of forecasting and planning horizons and by encompassing indirect or direct load information, even performance feedback, while maintaining the flexibility and robustness of the dispatching approach. Preliminary results are proven in the special case of proportionate flow shops with pre-emption. Many optimal rules for lateness and tardiness

problems are extended from the single machine case to flow shops. Appropriate lead time estimation used in setting operation due dates can be shown to guarantee the achievement of a global optimum when applying a myopic rule locally. In more general job shop environments, we study scheduling with due dates when jobs have different tardiness penalties. Advanced slack evaluation methods have been developed for our Apparent Urgency rule and for the modified CoverT rule. First, waiting line analysis furnishes the use of indirect load information, such as the distribution of the jobs' weights and processing times, in assigning static priority-based waiting time estimates for each operation. Second, the waiting time estimation and look-ahead parameters of the rules are further adjusted on the basis of direct, periodically updated state information, such as the anticipated queue lengths in the shop. Third, an iterative scheme is used to revise new lead time estimates based on the jobs' realized waiting times in successive schedules. This lead time iteration provides also feedback from the performance of the rule for the coordination of the priority assignments. GRA

N85-22091# Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate School of Industrial Administration.
NEEDS, OPPORTUNITIES, AND OPTIONS FOR LARGE SCALE SYSTEMS RESEARCH
Gerald L. Thompson Oct. 1984 65 p refs Presented at a Conf. on Large Scale Systems Res., Pittsburgh, 26-27 Mar. 1984
(Contract DE-AC01-84ER-30059)
(DE85-004642; DOE/ER-30059/1) Avail: NTIS HC A04/MF A01

Large Scale Systems were studied in order to facilitate the development of a true large systems theory. Experts in the fields of electrical engineering, chemical engineering and manufacturing/operations research were asked for their ideas concerning large scale systems research. A conference was held which included three experts in each areas as panel members to discuss the general area of large scale systems research. Ideas presented and the recommendations proposed by the attendees are summarized. DOE

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-22092# Wisconsin Univ., Madison. Mathematics Research Center.
APPROXIMATION ORDER FROM CERTAIN SPACES OF SMOOTH BIVARIATE SPLINES ON A 3-DIRECTION MESH Technical Summary Report
R. Q. Jia Sep. 1984 28 p
(Contract DAAG29-80-C-0041; Grant NSF MSS-82-10950)
(AD-A149633; MRC-TSR-2749) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper studies the approximation order from certain spaces of smooth vibariate splines on a three-direction mesh. Approximation order is a measurement of how well an approximation scheme works. This concept is important in numerical analysis. Unlike the situation in univariate spline approximation, the task of determining approximation order of multivariate spline spaces is very difficult. This report opens up a way to attack this problem. It is hoped that this method may eventually lead to a complete solution of this problem. GRA

N85-22093# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ON ERGODIC ACTIONS WHOSE SELF-JOININGS ARE GRAPHS
A. DelJunco (Toronto Univ., Ontario) and D. J. Rudolph (Maryland Univ., College Park) Aug. 1984 58 p refs
(CWI-PM-R8408; B8478828) Avail: NTIS HC A04/MF A01

Rudolph's notion of minimal self-joinings and Veech's property 5 are generalized by calling an ergodic measure-preserving action of a locally compact group on a probability space simple if every ergodic joining of it to itself is either product measure or is supported on a graph, and a similar condition holds for multiple self-joinings. The joinings of a simple action with an arbitrary ergodic action can be explicitly described. A weakly-mixing group extension of an action with minimal self-joinings is simple. The action of a closed, normal, co-compact subgroup in a weakly-mixing simple action is again simple. Two simple actions with no common factors are disjoint. The time-one flow of a weakly-mixing flow with minimal self-joinings is prime. Distinct positive times in a ZZ-action with minimal self-joinings are disjoint. Author (ESA)

N85-22094# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
INVARIANT DIFFERENTIAL OPERATORS ON A SEMISIMPLE SYMMETRIC SPACE AND FINITE MULTIPLICITIES IN A PLANCHEREL FORMULA
E. P. vandenBan Aug. 1984 15 p refs Submitted for publication
(CWI-PM-R8409; B8478825) Avail: NTIS HC A02/MF A01

The algebra ID (G/H) of invariant differential operators on a semisimple symmetric space G/H, is studied. Results show that the action of ID (G/H) diagonalizes over the discrete part of L sq (G/H), and that the irreducible constituents of an abstract Plancherel formula for L sq (G/H) occur with finite multiplicities. This implies that discrete series representations occur with finite multiplicities in L sq (G/H). Author (ESA)

N85-22095# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
ASYMPTOTIC BEHAVIOR OF MATRIX COEFFICIENTS RELATED TO REDUCTIVE SYMMETRIC SPACES
E. P. vandenBan Oct. 1984 81 p refs Submitted for publication
(CWI-PM-R8410; B8478831) Avail: NTIS HC A05/MF A01

The asymptotic behavior of K-finite H-invariant matrix coefficients related to a reductive symmetric space G/H is studied. In all directions to infinity this behavior is described by absolutely converging series expansions similar to those in the group case. A generalization of Harish-Chandra's Schwartz space is introduced. Author (ESA)

N85-22096# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
EXPERIMENTAL MATHEMATICS
M. Hazewinkel Oct. 1984 42 p refs Submitted for publication
(CWI-PM-R8411; B8478829) Avail: NTIS HC A03/MF A01

The use of a computer to perform mathematical experiments is discussed. The hard hexagon model of lattice statistical mechanics; chaos and universality for iterated maps of an interval onto itself; integral systems and solitons; the Atkin-Swinnerton-Dyer conjectures; Julia sets; formal groups; antidiffusions; and the traveling salesman problem are reviewed. Author (ESA)

N85-22097# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
BROWNIAN MOTION WITH A PARABOLIC DRIFT AND AIRY FUNCTIONS
P. Groenebroom Oct. 1984 49 p refs Submitted for publication
(CWI-MS-R8413; B8478783) Avail: NTIS HC A03/MF A01

The densities of first passage times of a Brownian motion process are determined analytically in terms of Airy functions; the joint distribution of the maximum and the location of the maximum of this process are also expressed in terms of Airy functions. Corresponding results are given for two-sided Brownian motion. The structure of a jump process of locations of maxima of Brownian motion with respect to a family of parabolas is derived. The distribution of excursion integrals is obtained. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-22098# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
STABLE MEASURES AND PROCESSES IN STATISTICAL PHYSICS
A. Weron and K. Weron Nov. 1984 15 p
(Contract F49620-82-C-0009)
(AD-A149592; TR-81; AFOSR-84-1182TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown how alpha-stable distributions arise in statistical physics. A probabilistic proof of Khalfin's formula for decaying quantum systems is given. Also ergodic properties of symmetric alpha-stable flows in classical statistical mechanics are discussed. GRA

N85-22099# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
DEVELOPMENT AND APPLICATION OF LOW ENERGY X-RAY AND ELECTRON PHYSICS Final Scientific Report, 1 Oct. 1983 - 30 Sep. 1984
B. L. Henke 6 Dec. 1984 220 p
(Grant AF-AFOSR-0001-84)
(AD-A149983; AFOSR-84-1270TR) Avail: NTIS HC A10/MF A01 CSCL 14/5

A new spectrograph system has been developed and calibrated in this AFOSR-supported laboratory for the absolute spectrometry of high intensity pulsed X-ray sources (fusion energy and X-ray laser development) in the 100-10,000 eV region. This spectral region is analyzed with fixed elliptically curved crystals and molecular or metal multilayers of 2d-values in the 3-160 A range. Twin channels are utilized for simultaneous time-integrated photographic recording and for time-resolved X-ray streak camera recording. Absolute calibrations of the elliptical analyzers, of the photographic film, and of the gold and CsI transmission photocathodes have been made using monoenergetic, CW laboratory X-ray sources. The overall transmission characteristics of the spectrograph have also been determined. The instrument has been designed for mounting through a pneumatically-controlled high-vacuum valve onto a four-inch port of a one-meter diameter source chamber and includes an appendage, high-vacuum, sputter/ion pre-pumping station. The initial testing and application of this new spectrographic system has been on the University of Rochester's LLE 24-laser-beam OMEGA facility. Author (GRA)

N85-22100# Stanford Univ., Calif. Dept. of Statistics.
A DIFFUSION PROCESS AND ITS APPLICATION TO DETECTING A CHANGE IN THE DRIFT OF BROWNIAN MOTION
Moshe Pollak (Hebrew Univ. of Jerusalem) and David Siegmund Sep. 1984 25 p
(Contract N00014-77-C-0306; Grant NSF MCS-80-24649; NR Proj. 042-373)
(AD-A150096; SU-TR-30; SU-TR-222) Avail: NTIS HC A02/MF A01 CSCL 07/4

The purpose of the present paper is to make a quantitative comparison of the Shiryayev-Roberts and Page procedures. We do this in the context of continuous time in order to use the machinery of diffusion processes to perform explicitly certain calculations, which seem impossible in discrete time. Although the continuous time results are not especially good approximations to the corresponding quantities in discrete time, they provide very useful comparative information on which to base selection of a stopping rule. This paper is organized as follows. The Shiryayev-Roberts process is defined and shown to be a novel diffusion process with some surprising properties. We also specify more precisely the basis for our comparison of the two procedures and give the results of some elementary calculations. These developments contain an asymptotic evaluation. We define a modification of our basic procedure and give an asymptotic evaluation of its average run length. Numerical comparisons and a discussion of their significance are contained next. Our conclusions are roughly these. In simple situations where the two procedures can be directly compared, neither seems dramatically superior to the other. However, the Shiryayev-Roberts procedure is more easily adapted to complex circumstances and consequently warrants additional study. GRA

N85-22101# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
REVIEW OF ANODE PHENOMENA IN VACUUM ARCS
H. C. Miller 1984 9 p refs Presented at the 11th Intern. Symp. on Discharges and Elec. Insulation in Vacuum, West Berlin, 24 Sep. 1984
(Contract DE-AC04-76DP-00656)
(DE85-002736; GEPP-OP-802b; CONF-840981-4) Avail: NTIS HC A02/MF A01

Five possible anode discharge modes of a vacuum arc are reviewed. Anode temperature measurements, anode ions and transitions of the arc into various modes are discussed. Theoretical explanations of anode phenomena are given. The dominant mechanism controlling the transition of the vacuum arc into an anode spot mode appears to depend upon the electrode geometry, the electrode material, and the current waveform of the particular vacuum arc being considered. DOE

N85-22102# Fermi National Accelerator Lab., Batavia, Ill.
SUPERCONDUCTING MAGNET TECHNOLOGY FOR ACCELERATORS
R. Palmer and A. V. Tollestrup Mar. 1984 77 p refs
(Contract DE-AC02-76CH-03000)
(DE85-004192; FNAL-TM-1251) Avail: NTIS HC A05/MF A01

A review article on superconducting magnets for accelerators should first answer the question, why superconductivity. The answer revolves around two pivotal facts: (1) fields in the range of 2 T to 10 T can be achieved; and (2) the operating cost can be less than conventional magnets. The relative importance of these two factors depends on the accelerator. In the case where an upgrade of an accelerator at an existing facility is planned, the ability to obtain fields higher than conventional magnets leads directly to an increase in machine energy for the given tunnel. In the case of a new facility, both factors must be balanced for the most economical machine. Ways to achieve this are discussed. DOE

N85-22103# National Bureau of Standards, Gaithersburg, Md.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 89, NUMBER 2, MARCH - APRIL 1984
Apr. 1984 85 p refs
(PB85-115426) Avail: NTIS HC A05/MF A01; SOD HC SN0003-003-72086-1 CSCL 20C

Instruments and methodology for performing precise physical measurements are presented. Topics include the following: (1) hollow cathode discharges - analytical applications; (2) an iterative calibration curve procedure; (3) determination of the viscoelastic shear modulus using forced torsional vibrations; and (4) an ultrasonic absolute power transfer standard. G.L.C.

N85-21563# Joint Publications Research Service, Arlington, Va.
MAGNETIC FIELD IN MAIN GAP OF SEPARATOR Abstract Only
Vaginak Onikovich Kartashyan, Vladimir Ivanovich Fadeyev, and Aleksandr Nikolayevich Spivak *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 39 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 20-23 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21564# Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF SMALL FERROMAGNETIC PARTICLES IN TRAVELING MAGNETIC FIELD Abstract Only
Vladimir Genrikhovich Deych and Vladimir Pavlovich Terekhov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 39-40 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 10, Oct. 1984 p 23-26 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-22104* National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTIC AGGLOMERATION METHODS AND APPARATUS Patent
Martin B. Barmatz, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 9 Oct. 1984 7 p Filed 24 Mar. 1982 Supersedes N82-27087 (20 - 17, p 2469) Sponsored by NASA (NASA-Case-NPO-15466-1; NAS 1.71:NPO-15466-1; US-Patent-4,475,921; US-Patent-Appl-SN-361217; US-Patent-Class-23-313R; US-Patent-Class-55-15; US-Patent-Class-55-277) Avail: US Patent and Trademark Office CSCL 20A

Methods are described for using acoustic energy to agglomerate fine particles on the order of one micron diameter that are suspended in gas, to provide agglomerates large enough for efficient removal by other techniques. The gas with suspended particles, is passed through the length of a chamber while acoustic energy at a resonant chamber mode is applied to set up one or more acoustic standing wave patterns that vibrate the suspended particles to bring them together so they agglomerate. Several widely different frequencies can be applied to efficiently vibrate particles of widely differing sizes. The standing wave pattern can be applied along directions transversed to the flow of the gas. The particles can be made to move in circles by applying acoustic energy in perpendicular directions with the energy in both directions being of the same wavelength but 90 deg out of phase.
Official Gazette of the U.S. Patent and Trademark Office

N85-22105* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH TEMPERATURE ACOUSTIC LEVITATOR Patent
Martin B. Barmatz, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 7 Aug. 1984 10 p Filed 26 Aug. 1983 Supersedes N83-36847 (24 - 24, p 4033) Sponsored by NASA (NASA-Case-NPO-16022-1; NAS 1.71:NPO-16022-1; US-Patent-4,463,606; US-Patent-Appl-SN-526750; US-Patent-Class-73-505) Avail: US Patent and Trademark Office CSCL 20A

A system is described for acoustically levitating an object within a portion of a chamber that is heated to a high temperature, while a driver at the opposite end of the chamber is maintained at a relatively low temperature. The cold end of the chamber is constructed so it can be telescoped to vary the length (L sub 1) of the cold end portion and therefore of the entire chamber, so that the chamber remains resonant to a normal mode frequency, and so that the pressure at the hot end of the chamber is maximized. The precise length of the chamber at any given time, is maintained at an optimum resonant length by a feedback loop. The feedback loop includes an acoustic pressure sensor at the hot end of the chamber, which delivers its output to a control circuit which controls a motor that varies the length (L) of the chamber to a level where the sensed acoustic pressure is a maximum.
Official Gazette of the U.S. Patent and Trademark Office

N85-22106 Department of the Navy, Washington, D. C.
CALIBRATION METHOD FOR ACOUSTIC SCATTERING MEASUREMENTS USING A SPHERICAL TARGET Patent
L. R. Dragonette, L. J. Frank, and S. K. Numrich, inventors (to Navy) Issued 9 Oct. 1984 9 p Supersedes AD-D009566 (AD-D011521; US-Patent-4,476,549; US-Patent-Appl-SN-364098; US-Patent-Class-367-13) Avail: US Patent and Trademark Office CSCL 20/1

This patent discloses a method for calibrating acoustic backscattering instrumentation utilizing a spherical body as a standard target. A spherical body made of high specific acoustic impedance material, such as tungsten carbide, is positioned a given distance from a source/receiver transducer which is energized to produce a short acoustic pulse directed toward the sphere. Acoustic signals reflected from the sphere are detected by the transducer and processed in the time domain to separate the rigid portion of the return from the elastic portions. The rigid portion is corrected for the transducer to sphere distance, the reflectivity of the sphere, and for the radius of the sphere. The resultant corrected signal represents the incident acoustic pulse produced by the transducer. GRA

N85-22107 Department of the Air Force, Washington, D.C.
METHOD AND APPARATUS FOR DETECTING ACOUSTIC EMISSIONS FROM METAL MATRIX WIRE Patent
G. F. Hawkins, inventor (to Air Force) Issued 11 Dec. 1984 5 p Supersedes AD-D010345 (AD-D011556; US-Patent-4,487,068; US-Patent-Appl-SN-502771; US-Patent-Class-73-587) Avail: US Patent and Trademark Office CSCL 09/1

An Apparatus for detecting acoustic emissions from metal matrix wire is described. It allows on-line measurement of the transverse strength of the wire as it is moving through its manufacturing process. A series of end and middle rollers guide the wire and form a bend in it. The location of the bend in the wire is maintained in contact with a liquid bath which, in turn, is contacted by the sensing surface of an acoustic transducer. Acoustic emissions from breaking of the fiber-matrix interface of the wire are transmitted by the bath and detected by the transducer. Author (GRA)

N85-22108*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FURTHER COMPARISON OF WIND TUNNEL AND AIRPLANE ACOUSTIC DATA FOR ADVANCED DESIGN HIGH SPEED PROPELLER MODELS
James H. Dittmar 1985 23 p refs To be presented at the 109th Meeting of the Acoust. Soc. of Am., Austin, Tex., 8-12 Apr. 1985
(NASA-TM-86935; E-2448; NAS 1.15:86935) Avail: NTIS HC A02/MF A01 CSCL 20A

Comparisons were made between the SR-2 and SR-3 model propeller noise data taken in the NASA 8-by-6 wind tunnel, in the United Technologies Research Center (UTRC) anechoic tunnel, and with boom and fuselage microphones on the NASA Jetstar airplane. Plots of peak blade passage tone noise versus helical tip Mach number generally showed good agreement. The levels of the airplane fuselage data were somewhat lower than the boom data by an approximately uniform value. The curve shapes were similar except for the UTRC data which was flatter than the other sets. This was attributed to the UTRC data being taken at constant power while the other data were taken at constant advance ratio. General curves of the peak blade passage tone versus helical tip Mach number fit through all the data are also presented. Directivity shape comparisons at the cruise condition were similar for the airplane and 8-by-6 tunnel data. The UTRC data peaked farther forward but, when an angle correction was made for the different axial Mach number used in the UTRC tests, the shape was similar to the others. The general agreement of the data from the four configurations enables the formation of a good consensus of the noise from these propellers. Author

N85-22109*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE TRANSMISSION LOSS OF A RECTANGULAR PLATE IN AN INFINITE BAFFLE
Louis A. Roussos Mar. 1985 36 p refs Presented at the 107th Meeting of the Acoustical Society of America, Norfolk, Va., 7-10 May 1984
(NASA-TP-2398; L-15861; NAS 1.60:2398) Avail: NTIS HC A03 MF A01 CSCL 20A

An improved analytical procedure was developed that allows for the efficient calculation of the noise transmission characteristics of a finite rectangular plate. Both isotropic and symmetrically laminated composite plates are considered. The plate is modeled with classic thin-plate theory and is assumed to be simply supported

on all four sides. The incident acoustic pressure is assumed to be a plane wave impinging on the plate at an arbitrary angle. The reradiated pressure is assumed to be negligible compared with the blocked pressure, and the plate vibrations are calculated by a normal-mode approach. A Green's function integral equation is used to link the plate vibrations to be transmitted far-field sound waves, and transmission loss is calculated from the ratio of incident to transmitted acoustic powers. The result is a versatile research and engineering analysis tool that predicts noise transmission loss and enables the determination of the modal behavior of the plate. E.A.K.

N85-22110# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A STOCHASTIC-MECHANICAL APPROACH TO ACOUSTIC PULSE PROPAGATION IN THE DEEP OCEAN SOUND CHANNEL
T. Dankel, Jr. Sep. 1984 34 p
(Contract N00014-81-K-0373)
(AD-A149596; LISS-8) Avail: NTIS HC A03/MF A01 CSCL 20/1

Using stochastic-mechanical methods borrowed from quantum physics, we study the average shape of an acoustic pulse from a source on the SOFAR axis as a function of range. As shown by Williamson, this shape is given by the graph of the probability density of travel time along a random ray. We sketch a possible approach to finding this probability density, and give a formula for its average value which predicts the known transition from near-range to far-range pulse shape. GRA

N85-22111# Science Applications, Inc., McLean, Va.
TWENTY-FIVE SOUND PROPAGATION TESTS ON THE CONTINENTAL SHELF BETWEEN LONG ISLAND, NEW YORK AND CAPE CANAVERAL, FLORIDA Final Report, 13 Sep. 1983 - 30 Nov. 1984
J. B. Hersey, C. B. Officer, Jr., L. Baxter, II, and L. C. Davis 30 Nov. 1984 95 p
(Contract N00014-83-C-0684)
(AD-A149869; SAIC-84/1424) Avail: NTIS HC A05/MF A01 CSCL 20/1

In 1954 and in 1955 sound propagation measurements were made combined with seismic refraction profiles, bathythermograph profiles, and continuous echo soundings over more than 42 different tracks that lie partly or wholly within the 200-meter depth contour of the U.S. east coast continental shelf between latitude 26 N and 40 N. Spectrum levels of propagation loss (PL) have been computed for octave frequency bands 50 to 100 Hz, 200 to 400 Hz, 800 to 1600 Hz, and 2400 to 4800 Hz. In general PL is greatest for the 50 to 100 cps band. PL for the other bands tends to be high if that for the 50 to 100 band is high. At ranges much less than 10 km PL is commonly frequency independent. At ranges of 10 km or greater for the 50-100 Hz band PL becomes greater than the higher bands by amounts varying from 3 dB to more than 20 dB in 18 out of 32 sound propagation profiles used in this study. Seventeen of the 32 also displayed as optimum frequency band either the 200-400 Hz or the 800-1600 Hz bands employed in the analysis. The remaining 12 or 13 profiles either do not display frequency dependence among the 4 bands used, or they display high-pass, low-pass, or band rejection behavior. GRA

N85-22112# Washington Univ., Seattle. Lab. for Applied Physics.
SURFACE FORWARD SCATTERING AND REFLECTION
E. I. Thorsos May 1984 47 p
(Contract N00024-81-C-6042)
(AD-A150115; APL-UW-7-83) Avail: NTIS HC A03/MF A01 CSCL 20/1

This report discusses high frequency (15-60 kHz) models of surface forward scattering and reflection that are appropriate for use in acoustic simulations based on ray tracing techniques. Typically, some of the following properties of a pulse after a single surface interaction are needed for modeling purposes: (1) the amplitude as a function of time in or near the specular direction (for example, this gives pulse elongation); (2) the corresponding amplitude statistics; (3) the partitioning into scattered (incoherent) and reflected (coherent) components in the specular direction; and (4) the changes in the frequency spectrum due to the moving surface. At a simpler level, (5) an effective reflection loss may be needed, e.g., for reverberation or one-way propagation simulations. At a more detailed level, (6) two-point statistics at the receiver may be desired. In what follows an attempt will be made to describe models for (1)-(5), but item (6) will not be addressed. With regard to scattering, it will be assumed that the primary interest for simulations lies in representing the scattered signal by an effective reflection loss due to the difficulty of including forward scattering in simulations. Thus, a detailed description of the angular distribution of the scattered intensity near the specular direction will not be given. GRA

N85-22113# Los Alamos Scientific Lab., N. Mex.
SOUND VELOCITY OF CARBON AT HIGH PRESSURES
J. W. Shaner, J. M. Brown, C. A. Swenson, and R. G. McQueen 11 Sep. 1984 4 p refs Presented at the Intern. Colloq. on the Phys. and Physicochem. of Highly Condensed Matter, Aussois, France, 11-14 Sep. 1984
(Contract W-7405-eng-36)
(DE85-002016; LA-UR-84-2799; CONF-8409145-5) Avail: NTIS HC A02/MF A01

The sound velocity in shock compressed graphite. The data are consistent with a model of solid diamond from 0.8 to 1.4 Mbar. DOE

N85-22114# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
EFFECTS OF SCATTERER SPACING STATISTICS ON ULTRASONIC BACKSCATTER SIGNAL SPECTRA
K. L. Telschow and G. D. Lassahn 1984 5 p refs Presented at the IEEE Ultrasonics Symp., Dallas, 14 Nov. 1984
(Contract DE-AC07-76ID-01570)
(DE85-003259; EGG-M-14484; CONF-8411119-2) Avail: NTIS HC A02/MF A01

The spectrum of an ultrasonic signal backscattered from grain boundaries within a material depends not only on the characteristics of the individual scattering centers but also on the statistical distribution of the distances between neighboring scatterers. Changes in scatterer spacing can cause large changes in the ultrasonic backscatter signal and complicate the interpretation of the signal spectra. These effects are illustrated and some examples of representative scatterer spacing distributions encountered in the nondestructive estimation of grain size in metals are given. DOE

N85-21421# Joint Publications Research Service, Arlington, Va.
PHOTOACOUSTIC EFFECT AND ITS APPLICATIONS Abstract Only
Moan Wei and Menglu Qian *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 90 Transl. into ENGLISH from Yingyong Shengxue (Beijing), v. 3, no. 4, Oct. 1984 p 5-11
(For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-22115# Stanford Univ., Calif. Dept. of Chemistry.
STATE-SELECTED ION-MOLECULE REACTION DYNAMICS Final Report, 1 Nov. 1982 - 31 Oct. 1984
Richard J. S. Morrison, William E. Conaway, and Richard N. Zare 15 Dec. 1984 7 p
(Contract F49620-83-C-0033)
(AD-A150068; AFOSR-84-1238TR) Avail: NTIS HC A02/MF A01 CSCL 07/5

By analyzing the photoelectron energies in several systems, it

has been demonstrated that multiphoton ionization (MPI) can selectively produce molecular ions predominantly in a single vibrational level by the proper choice of the laser wavelength employed. Thus MPI provides a powerful new technique for producing high densities of internally state-selected reagent ion for chemical reaction dynamics studies. This approach is being taken for studying the ion-molecule reactions of NH3(+) (v) which has been prepared with v = 0-9 vibrational quanta in the nu sub 2 umbrella-bending mode. GRA

N85-22116# Mission Research Corp., Albuquerque, N. Mex.
THEORETICAL STUDY OF COLLECTIVE ION ACCELERATION IN THE LUCE DIODE Final Report, Jul. 1982 - Jul. 1983
Donald J. Sullivan and Rickey J. Faehl Nov. 1984 149 p
(Contract F49620-82-C-0087; AF Proj. 2301)
(AD-A150107; AMRC-R-663; AFOSR-84-1224TR) Avail: NTIS HC A07/MF A01 CSCL 20/9

The most successful collective ion acceleration to date has been observed when a relativistic electron beam has been discharged in the Luce diode (dielectric anode) geometry. In these experiments the ratio of peak proton energy to beam kinetic energy has been as high as 30. The ion source is a plasma formed on the anode surface by electron impact ionization of the dielectric material. The diode physics, which couples the electron beam generation to the number of ions extracted from the plasma, is an essential feature of the acceleration mechanism in the Luce configuration. Simulations where the electron beam is injected through a preformed dense plasma are significantly different from those where the electron beam self-consistently determines the ion plasma density and dynamics in the diode. The main difference is in unstable wave growth. In the Luce diode the instability is predominant. In other localized plasma source collective ion accelerators the main acceleration takes place due to a hydrodynamic plasma free expansion. However, both Luce diodes and other plasma source accelerators can display both mechanisms to some extent. GRA

N85-22117# Stanford Linear Accelerator Center, Calif.
SINGLE-CAVITY SLED DEVICE
B. A. Lippmann Sep. 1984 4 p
(Contract DE-AC03-76SF-00515)
(DE85-002587; SU-SLAC/AP-33) Avail: NTIS HC A02/MF A01

The conventional SLED device used at SLAC requires two cavities. However, the same effect can be obtained with a single cavity; the theory and operation of the device is the same, only the hardware is charged. The single cavity device is described. DOE

N85-22118# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
STATISTICAL PHENOMENA IN PARTICLE BEAMS
Joseph J. Bisognano Sep. 1984 28 p refs Presented at the 3rd Summer School on High-Energy Particle Accelerators, Batavia, Ill., 1 Jul. 1983
(Contract DE-AC03-76SF-00098)
(DE85-001050; LBL-17714; CONF-8307141-1) Avail: NTIS HC A03/MF A01

Particle beams are subject to a variety of apparently distinct statistical phenomena such as intrabeam scattering, stochastic cooling, electron cooling, coherent instabilities, and radiofrequency noise diffusion. In fact, both the physics and mathematical description of these mechanisms are quite similar, with the notion of correlation as a powerful unifying principle. A basis for understanding the wide range of statistical phenomena that have been discussed is given. In the course of this study the tools of the trade will be introduced, e.g., the Vlasov and Fokker-Planck equations, noise theory, correlation functions, and beam transfer functions. Although a major concern will be to provide equations for analyzing machine design, the primary goal is to introduce a basic set of physical concepts having a very broad range of applicability. DOE

N85-22119# Florida Univ., Gainesville. Particle Theory Group.
JET TOPOLOGIES IN HADRON-HADRON COLLISIONS
R. D. Field 1984 39 p refs Presented at the 4th Topical Workshop on Proton Antiproton Collider Phys., Bern, 4-8 Mar. 1984
(Contract DE-AS05-81ER-40008)
(DE85-001328; DOE/ER-40008/58; CONF-8403130-5) Avail: NTIS HC A03/MF A01

Event topologies in pp collisions at W = 60 GeV and in anti pp collisions at W = 540 GeV resulting from a QCD Monte-Carlo model are examined. The model includes gluon radiation both in the initial and final states and the outgoing hadrons are labeled according to whether they arise before or after the hard parton-parton collision. Transverse energy flows and transversed energy grids are studied with emphasis, not on jet finding, but on the patterns of energy deposition. These patterns are quantified by examining the multiplicity of transverse energy clusters each of which has energy greater than some fixed amount. At high transverse energy the model produces events that are slightly less two-jet like than the UA2 data. However, the predicted frequency of occurrence of three cluster events is in good agreement. DOE

N85-22120# Naval Research Lab., Washington, D. C.
SIMULATION OF SPACE CHARGE EFFECTS IN PARTICLE ACCELERATORS Annual Report, 1 Aug. 1983 - 30 Sep. 1984
I. Haber 1984 13 p refs
(Contract DE-AI08-79DP-40092)
(DE85-001828; DOE/DP-40092/6) Avail: NTIS HC A02/MF A01

Emphasis centered on investigating the nonlinear dynamics of a very low emittance beam with a realistic distribution function - especially when complications such as the image forces from a nearby conducting electrode are considered. Versions of the SHIFT (Simulation of Heavy Ion Fusion Transport) series of computer codes were installed on machines available to the HIF community. The enhanced availability of these codes facilitated their use outside of NRL. For example, simulation results with a significant impact on MBE design were obtained at LBL using the MPFCC Version of SHIFT-XY. DOE

N85-22121# Oak Ridge National Lab., Tenn.
BIBLIOGRAPHY OF ATOMIC AND MOLECULAR PROCESSES, 1983
C. F. Barnett, comp., D. H. Crandall, comp., H. B. Gilbody, comp., D. C. Gregory, comp., M. I. Kirkpatrick, comp., E. W. McDaniel, comp., R. H. McKnight, comp., F. W. Meyer, comp., T. J. Morgan, comp., and R. A. Phaneuf, comp. Oct. 1984 215 p
(Contract DE-AC05-84OR-21400)
(DE85-000662; ORNL-6095) Avail: NTIS HC A10/MF A01

This annotated bibliography includes 1762 citations on atomic and molecular processes published during 1983. Sources include scientific journals, conference proceedings, and books. Each entry is designated by one or more of the 114 categories of atomic and molecular processes used by the Controlled Fusion Atomic Data Center, Oak Ridge National Laboratory to classify data. Also indicated is whether the work was experimental or theoretical, what energy range was covered, what reactants were investigated, and the country of origin of the first author. Following the bibliographical listing, the entries are indexed according to the categories and according to reactants within each subcategory. DOE

N85-22122# Argonne National Lab., Ill. Physics Div.
MULTIPARTICLE 3D IMAGING TECHNIQUE TO STUDY THE STRUCTURE OF MOLECULAR IONS
W. Koening, A. Faibis, E. P. Kanter, Z. Vager (Weizmann Inst. of Sci., Rehovoth, Israel), and B. J. Zabransky 1984 22 p refs Presented at the 8th Conf. on the Application of Accelerators in Research and Industry, Denton, Tex., 12 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-001843; CONF-841117-16) Avail: NTIS HC A02/MF A01

When energetic molecular ions (E = 0.1 to 0.5 MeV/amu) pass through thin solid targets a Coulomb explosion ensues due

to the rapid (approx. 10 to the -17th power s) stripping of the valence electrons. This process has been successfully used to derive stereochemical information on diatomic and on selected triatomic ions. In order to investigate more complex molecular ions as well as to obtain more accurate and detailed structure information, a large area, multiparticle, position- and time-sensitive detector was developed to detect all atomic fragments in coincidence. The requirement of multiparticle detection independent of the relative particle positions leads to a rather complex data-readout and - reduction system containing approx. 650 analog-to-digital conversions per event. The system relies heavily on techniques developed for high energy physics experiments during recent years. The single event resolution of the apparatus with respect to bond-lengths and -angles was studied by Monte Carlo simulations and is typically a few percent. DOE

N85-22123# Oak Ridge National Lab., Tenn. Physics Div.
VACANCY-REARRANGEMENT THEORY IN THE FIRST MAGNUS APPROXIMATION
Richard L. Becker 1984 8 p refs Presented at the 2nd Workshop on High-Energy Ion-Atom Collision Processes, Debrecen, Hungary, 27 Aug. 1984
(Contract DE-AC05-84OR-21400)
(DE85-004435; CONF-8408110-4) Avail: NTIS HC A02/MF A01

The first Magnus approximation (M1A), a unitarized Born approximation is used in semiclassical collision theory. The M1A gives a substantial improvement over the first Born approximation (B1A) and can give a good approximation to a full coupled channels calculation of the mean L-shell vacancy probability per electron, p/sub L/, when the L-vacancies are accompanied by a K-shell vacancy (p/sub L/ is obtained experimentally from measurements of K/sub (ALPHA)/-satellite intensities). For sufficiently strong projectile-electron interactions (sufficiently large Z/sub p/ or small v), the M1A ceases to reproduce the coupled channels results, but it is accurate over a much wider range of Z/sub p/ and v than the B1A. DOE

N85-22124# Brookhaven National Lab., Upton, N. Y.
BEAM LOSS DUE TO THE APERTURE LIMITATION RESULTING FROM INTRABEAM SCATTERING
S. Y. Lee 12 Sep. 1984 14 p refs
(Contract DE-AC02-76CH-00016)
(DE85-005138; BNL-35438; RHIC-TN-5) Avail: NTIS HC A02/MF A01

A diffusion equation is used to evaluate the beam loss in the presence of aperture limitation resulting from the intrabeam scattering. We discuss the effect of different boundary conditions. Satisfactory beam intensity can be maintained within the proposed RHIC operation time. DOE

N85-22125# Los Alamos Scientific Lab., N. Mex.
USER'S GUIDE FOR TWOHEX: A CODE PACKAGE FOR TWO-DIMENSIONAL, NEUTRAL-PARTICLE TRANSPORT IN EQUILATERAL TRIANGULAR MESHES
Wallace F. Walters, Forrest W. Brinkley, and Duane R. Marr Oct. 1984 38 p refs
(Contract W-7405-eng-36)
(DE85-004482; LA-10258-M) Avail: NTIS HC A03/MF A01

The TWOHEX program solves the two-dimensional multigroup transport equation on an equilateral triangular mesh in the x,y plane. Both regular and adjoint, inhomogeneous (fixed source) and homogeneous problems are solved. Three problem domains are treated by TWOHEX. The whole core domain is a 60 deg parallelogram with vacuum boundary conditions on each face. The third core domain is a 120 deg deg parallelogram with two vacuum and two rotational boundary conditions. The sixth core domain is a 60 deg parallelogram with two vacuum and two rotational boundary conditions. General anisotropic scattering is allowed and an anisotropic inhomogeneous source may be input as cell averages. DOE

N85-22126# Oklahoma Univ., Norman. Dept. of Physics and Astronomy.
THEORETICAL STUDY OF NEAR-THRESHOLD ELECTRON-MOLECULE SCATTERING Progress Report
Michael A. Morrison Jul. 1984 18 p refs
(Contract DE-AS05-79ER-10513)
(DE85-004530; DOE/ER-10513/T3) Avail: NTIS HC A02/MF A01

Theoretical calculation of accurate low energy electron-molecule cross sections requires: (1) an accurate interaction potential; and (2) a computationally tractable formulation of the collision theory. The potential must be free of parameters that require adjustment to experimental cross sections. Near the threshold for a nuclear excitation the collision theory must accurately, if approximately, take account of the coupling of the nuclear dynamics and the (quantal) motion of the scattering electron. Progress has been made on two facets of the electron-molecule interaction: exchange and polarization effects. The tuned free-electron-gas exchange potential has been generalized to allow for vibrational excitation, and, the validity of this model for nuclear excitations has been studied. A procedure for determining an ab initio (parameter-free) polarization potential that takes (approximate) account of non-adiabatic effects has been implemented and tested for e-H2 scattering. Results calculated with this model potential agree well with those of benchmark optical-potential studies. DOE

N85-22127# Stanford Linear Accelerator Center, Calif.
REVIEW OF POLARIZED PROTON BEAM TECHNIQUES AND A REPORT ON THE WORKSHOP ON POLARIZED BEAMS
Ronald D. Ruth Oct. 1984 15 p refs Presented at the 6th Intern. Symp. on High Energy Spin Phys., Marseille, 12-19 Sep. 1984
(Contract DE-AC03-76SF-00515)
(DE85-004390; SU-SLAC-PUB-3472; CONF-8409162-5) Avail: NTIS HC A02/MF A01

The basic techniques for polarized proton beams (spin flip, resonance jumps, Siberian Snakes, etc.) are introduced and a report on the Workshop on Acceleration and Storage of Polarized Protons and Electrons in Very Large Machines is presented. The elimination of the depolarizing effects of resonances is specifically addressed. DOE

N85-21419# Joint Publications Research Service, Arlington, Va.
POTENTIAL AT ATOMIC BOUNDARIES IN THE TF (OR TFD) MODEL AND EQUATIONS OF STATES
Cheng Kaijia, Fan Qike, and Gao Zhanpeng *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 51-73 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 33, no. 2, Feb. 1984 p 176-192 (For primary document see N85-21416 12-31)
Avail: NTIS HC A07/MF A01

N85-21565# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL SIMULATION OF THERMAL PRROCESSES INVOLVED IN ELECTRON-BEAM TREATMENT Abstract Only
Vitaliy Grigoryevich Boltin, Lev Vitalyevich Peysakhovich, and Aleksandr Vasilyevich Shpagin *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 46 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 103-106 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-22128# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE DEVELOPMENT: SAFETY TEST PROGRAM. POSTIMPACT EVALUATION, DESIGN ITERA-

TION TEST 4 Progress Report
T. G. George and F. W. Schonfeld Dec. 1984 31 p refs
(Contract W-7405-eng-36)
(LA-10217-Sr) Avail: NTIS HC A03/MF A01

The general-purpose heat source (GPHS) provides power for space missions by transmitting the heat of Pu-238 decay to thermoelectric elements. Because of the inevitable return of certain aborted missions, the heat source must be designed and constructed to survive both re-entry and Earth impact. The design iteration test (DIT) series is part of an ongoing test program. The fourth test (DIT-4) was designed to evaluate the effect on impact behavior of changing the procedure used at the mount facility (MF) to remove surface defects from drawn cups. The change involved switching from a manual abrasion technique to a motorized, rubber-bonded abrasive wheel. In DIT-4 a partial GPHS module containing two fueled clads (one cleaned manually, and one cleaned with an abrasive wheel) was impacted at a velocity of 58 m/s and a temperature of 930 C. Both capsules were severely deformed by the impact and contained large interal cracks. Although the manually cleaned capsule breached, the breaching crack was only 2 microns wide and released negligible amounts of fuel. There did not appear to be any correlation between cleaning method and capsule performance. Postimpact analyses of the DIT-4 test components are described with emphasis on microstructure and impact response. M.G.

N85-22129# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE DEVELOPMENT: SAFETY TEST PROGRAM. POSTIMPACT EVALUATION, DESIGN ITERATION TEST 5 Progress Report
T. G. George and F. W. Schonfeld Dec. 1984 37 p refs
(Contract W-7405-eng-36)
(LA-10232-SR) Avail: NTIS

The general-purpose heat source (GPHS) provides power for space missions by transmitting the heat of Pu-238 decay to thermoelectric elements. Because of the inevitable return of certain aborted missions, the heat source must be designed and constructed to survive both reentry and Earth impact. The design iteration test (DIT) series is part of an ongoing impact test program. The DIT-5 was designed to compare the impact response of a GPHS fueled clad that was welded with a four-pole arc oscillator with the impact response of a clad welded with a two-pole oscillator. In DIT-5 a partial GPHS module containing two fueled clads was impacted at 60.5 m/s and 930 C. The fuel capsules were severly deformed by the impact; both clads breached. The capsule welded with a four-pole oscillator failed extensively. Neither failure was related to the welding technique. Postimpact analyses of the test components are described, with emphasis on microstructure and impact response. E.A.K.

N85-22130# Indiana Univ., Bloomington.
WORKSHOP ON NUCLEAR DYNAMICS 3
Vic Viola, ed. Apr. 1984 234 p refs Workshop held at Copper Mountain, Colo., 5-9 Mar. 1984
(Contract DE-AC01-81ER-40007)
(INC-40007-24; CONF-8403101) Avail: NTIS HC A11/MF A01

The features of nucleus-nucleus collisions were examined. For nuclear fission, the self consistent application of the finite range liquid drop model to heavy ion induced fission data appears to provide a satisfactory description of these processes, removing many previous ambiguities. Damped collisions sessions and their increasingly sophisticated efforts were discussed in terms of theoretical developments and the quality of the available data base. The important problem of deriving primary fragment distributions from the observed experimental data was examined. Data obtained from the new generation of heavy ion accelerators were analyzed. The need for greater theoretical attention to the regime of nucleus-nucleus collisions was emphasized. Results from the plastic ball and streamer chamber experiments are yielding impressive results which promise to have a major impact on our understanding of the nuclear equation of state. E.A.K.

N85-22131# Los Alamos Scientific Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE DEVELOPMENT: SAFETY TEST PROGRAM. POSTIMPACT EVALUATION, DESIGN ITERATION TEST 1 Progress Report
F. W. Schonfeld Apr. 1984 71 p refs
(Contract W-7405-eng-36)
(LA-9680-SR) Avail: NTIS HC A04/MF A01

The general purpose heat source (GPHS) provides power for space missions by transmitting the heat of (238)PuO decay to thermoelectric elements. Because of the inevitable return of certain missions, the heat source must be designed and constructed to survive reentry and Earth impact. The Design Iteration Test (DIT) series is part of an ongoing impact test program. The first DIT used a full GPHS module containing two graphite impact shells (GISs); each GIS contained two iridium (0.3 wt%) capsules filled with (238)PuO. It was impacted at 57 m/s and 930 C. All four fuel capsules survived and none was breached. However, serious cracking of the iridium alloy capsules was found; some cracks extended through approx. 70% of the wall thickness. Postimpact analyses of the unit are described with emphasis on weld structure and performance. E.A.K.

N85-22132# Department of Energy, Washington, D. C. Office of Nuclear Energy.
PROCEEDINGS OF THE 1984 DOE NUCLEAR REACTOR AND FACILITY SAFETY CONFERENCE, VOLUME 1
1 Mar. 1984 276 p refs Conf. held at Rockville, Md., 27 Feb. - 1 Mar. 1984 2 Vol.
(DE84-012130; CONF-840257-Vol-1) Avail: NTIS HC A13/MF A01

Various aspects of nuclear reactor safety are discussed. Regulatory standards, cleanup and decommissioning of Department of Energy facilities, safety requirements, and risk assessment are among the topics discussed. R.J.F.

N85-22133# Department of Energy, Washington, D. C. Office of Nuclear Safety.
PROCEEDINGS OF THE DOE NUCLEAR REACTOR AND FACILITY SAFETY CONFERENCE, VOLUME 2
1 Mar. 1984 279 p refs Conf. held at Rockville, Md., 27 Feb. - 1 Mar. 1984 2 Vol.
(Contract DE-AC05-76OR-00033)
(DE84-012694; CONF-840257-Vol-2) Avail: NTIS HC A13/MF A01

Various aspects of nuclear reactor safety are discussed. Accidents, training, task analysis, robotics, man machine interfacing, and human factors engineering are among the topics discussed. R.J.F.

N85-22134# Los Alamos Scientific Lab., N. Mex.
IRRADIATION EFFECTS ON FUELS FOR SPACE REACTORS
William A. Ranken and August W. Cronenberg (Engineering Science and Analysis, Idaho Falls, Id.) 1984 38 p refs Presented at the 1st Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 10-13 Jan. 1984
(Contract W-7405-eng-36)
(DE84-016460; LA-UR-84-2651; CONF-840113-10) Avail: NTIS HC A03/MF A01

The primary advantage of UC and UN over UO2 is higher thermal conductivity and attendent lower fuel temperature at equivalent pellet diameter and power density, while UO2 offers the distinct benefit of well-known irradiation performance. Irradiation test results indicate that at equivalent burnup, temperature, and porosity conditions, UC experiences higher swelling than UO2 or UN. Fission gas swelling becomes important at fuel temperatures above 1320 K for UC, and at somewhat higher temperatures for UO2 and UN. Evidence exists that at equivalent fuel temperatures and burnups, high density UO2 and UN experience comparable swelling behavior; however, differences in thermal conductivity influence overall irradiation performance. The low conductivity of UO2 results in higher thermal gradients which contribute to fuel microcracking and gas release. As a result UO2 exhibits higher

fractional gas release than UN, at least or burnups up to about 3%. DOE

N85-22135# Colorado Univ., Boulder. Nuclear Physics Lab.
THEORETICAL NUCLEAR PHYSICS Progress Report, 1 Aug. 1983 - 30 Sep. 1984
P. D. Kunz and Ernest Rost Nov. 1984 17 p refs
(Contract DE-AC02-81ER-40015)
(DE85-003466; DOE/ER-40015/3) Avail: NTIS HC A02/MF A01

Progress is described on the following projects: (1) microscopic relativistic nucleon-nucleus inelastic scattering; (2) nuclear currents and polarization-asymmetry differences in inelastic proton-nucleus scattering; (3) relativistic plane wave impulse approximation for proton-nucleus inelastic scattering; (4) Dirac relativistic impulse approximation (DRIA) computer program; (5) relativistic treatment of exchange; (6) on the insensitivity of weak interaction amplitudes to relativistic nuclear dynamics; (7) Coulomb corrections in transfer reactions; (8) energy dependence of the Li7(p,d) Li6 reaction to the 1(+) and 3(+) states; and (9) Dirac formulation of the 9p.(GAMMA) reaction. Publications are listed. DOE

N85-22136# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
SHALLOW LAND BURIAL TECHNOLOGY: HUMID
E. C. Davis and G. T. Yeh 1984 20 p refs Presented at the 6th Ann. Low-level Waste Management Program Participants' Information Meeting, Denver, 11 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-004432; ORNL-ESD-2434; CONF-8409115-18) Avail: NTIS HC A02/MF A01

Trench lining and grouting, are being demonstrated and evaluated experimental trenches containing compacted low-level waste. Two finite-element hydrologic models were developed to model water movement and solute transport at a waste disposal site. Though the economic analysis of the two trench treatments favored Hypalon lining, results of field experiments examining waste hydrologic isolation favored the cement-bentonite grout treatment. Data from water pump-out and water pump-in tests suggest that the original goal of constructing watertight liners in three experimental trenches was not achieved. Trench-cover subsidence measured over two of the three lined trenches did not occur over any of the three grouted or three control (untreated) trenches. Results indicate that the cement-bentonite treatment provides a degree of waste isolation not afforded by the lined and control trenches and should be considered for use at shallow land burial (SLB) sites with water-related problems. DOE

N85-22137# Florida State Univ., Tallahassee.
RESEARCH IN THEORETICAL NUCLEAR PHYSICS Progress Report, 1 Mar. 1984 - 28 Feb. 1985
D. Robson 1984 12 p refs
(Contract DE-AS05-79ER-10419)
(DE85-004349; DOE/ER-10419/T2) Avail: NTIS HC A02/MF A01

Efforts to describe multi-hadron systems in terms of quark-gluon dynamics continued in the past year with the emphasis being on studying models which are motivated by the underlying symmetries of QCD. Of particular concern are three major symmetries: Lorentz covariance, local SU(3) color gauge invariance and chiral invariance. A large fraction of quark models of hadrons do not incorporate any of these symmetries and in many cases such models produce unphysical predictions, e.g., color Van der Waal's interactions, discontinuous axial vector currents, divergent self energies, etc. Since it does not appear possible as yet to include all the desired ingredients of QCD, models were studied which incorporate some of the major consequence of the underlying QCD theory. Two major areas of study are discussed: nucleon-nucleon systems and relativistic equations. DOE

N85-22138# Los Alamos Scientific Lab., N. Mex.
RESEARCH AND DEVELOPMENT RELATED TO THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS Progress Report, 1 Oct. - 31 Dec. 1983
K. Wolfsberg, comp. and D. T. Vaniman, comp. Aug. 1984 78 p refs
(Contract W-7405-eng-36)
(DE85-002303; LA-10032-PR) Avail: NTIS HC A05/MF A01

This report summarizes the contribution of the Los Alamos National Laboratory to the Nevada Nuclear Waste Storage Investigations for the first quarter of FY 1984. The status of the following studies is given: (1) geochemistry of tuff; (2) mineralogy-petrology of tuff; (3) tectonics and volcanism; (4) tuff laboratory properties; (5) sealing materials evaluation; and (6) quality assurance. DOE

74 OPTICS

Includes light phenomena.

N85-22139* National Aeronautics and Space Administration. Pasadena Office, Calif.
FOCAL PLANE ARRAY OPTICAL PROXIMITY SENSOR Patent
Alan R. Johnston, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 23 Oct. 1984 11 p Filed 11 Mar. 1981 Supersedes N81-22894 (19 - 13, p 1834) Sponsored by NASA (NASA-Case-NPO-15155-1; NAS 1.71:NPO-15155-1; US-Patent-4,479,053; US-Patent-Appl-SN-242797; US-Patent-Class-250-221; US-Patent-Class-340-555) Avail: US Patent and Trademark Office CSCL 20F

An optical proximity sensor for optically detecting an object within a predetermined detection volume is described. More specifically, an optical proximity sensor is disclosed having an illuminator assembly including lens and a plurality of light-emitting diodes located at first predetermined positions along the focal plane of the illuminator lens. A detector assembly including a detector lens and a plurality of photodiodes located at second predetermined positions along the focal plane of the detector lens is also provided. The two lenses are spaced apart a predetermined distance in order to define a predetermined detection volume. Additionally, a combination of optical proximity sensors, according to the invention, is disclosed wherein the sensors can be used in conjunction with a vehicle to provide a safety system for warning an operator when an object is within a volume defined by the proximity sensor combination.
Official Gazette of the U.S. Patent and Trademark Office

N85-22140 Department of the Navy, Washington, D. C.
ATMOSPHERIC TRANSMISSOMETER Patent
M. Geller, inventor (to Navy) Issued 4 Sep. 1984 13 p Supersedes AD-D009808
(AD-D011540; US-Patent-4,469,443; US-Patent-Appl-SN-383867; US-Patent-Class-356-364) Avail: US Patent and Trademark Office CSCL 20/6

An apparatus and method is described for separately measuring the optical intensities of the following: a sample beam having traversed a sample medium; a backscattered beam having been backscattered by the sample medium; a composite beam composed of the sample beam plus a reference beam having traversed a reference medium; and a second composite beam composed of the backscattered beam plus the reference beam. Measurements of these parameters are accomplished through the use of a linearly polarized source beam whose plane of polarization may be rotated between two orthogonal planes. The source beam is split into the sample and reference beams. The plane of polarization of the sample beam is caused to be rotated 90 degrees from the plane of polarization of the backscattered beam after interaction with the sample medium. The plane of polarization of the reference beam is selectively controlled between two orthogonal planes such that when combined with the sample beam and backscattered beam a polarization analyzer will allow passage of only those portions with a preselected plane of polarization for measurement and analysis of the light intensity. GRA

N85-22141 Department of the Navy, Washington, D. C.
HIGH RESOLUTION DIFFRACTION GRATING Patent
L. Sica, Jr., inventor (to Navy) Issued 9 Oct. 1984 5 p Supersedes AD-D009747
(AD-D011541; US-Patent-4,475,792; US-Patent-Appl-SN-402403; US-Patent-Class-350-162.17) Avail: US Patent and Trademark Office CSCL 20/6

An optical prism, with an input surface, a reflecting surface and a base, and with a diffraction grating formed on the reflecting surface is described. The prism is designed so that if an input beam is incident normal to the input surface, then the efficiency of the order diffracted in the direction opposite the input beam is greater than a predetermined value. If the prism is fabricated of a material with index of refraction n, then the resolving power of the grating is increased by n. GRA

N85-22142 Department of the Navy, Washington, D. C.
TEMPERATURE-INSENSITIVE OPTICAL FIBERS Patent
N. Lagakos and J. A. Bucaro, inventors (to Navy) Issued 13 Nov. 1984 4 p Supersedes AD-D010125
(AD-D011551; US-Patent-4,482,205; US-Patent-Appl-SN-432215; US-Patent-Class-350-96.34) Avail: US Patent and Trademark Office CSCL 20/6

This invention pertains generally to optical fibers and more particularly to optical fibers with reduced temperature sensitivity. It is an object of this invention to fabricate optical fibers with reduced thermal sensitivity. A further object is to minimize the phase shift of light propagating in a composite optical fiber. These and other objects are achieved by a composite optical fiber comprising a light-propagating core having a minimum variation of the index of refraction with temperature at constant density and at least one outer layer capable of restricting the axial expansion of the core rod without interfering with any radial expansion of the core. GRA

N85-22143# Wisconsin Univ., Madison. Marine Studies Center.
AN AIRBORNE INFRARED THERMAL SCANNING SYSTEM FOR EASY USE ON NAVY P-3 AIRCRAFT Final Report
T. Green, III, M. J. Green, and F. L. Scarpace 1 Sep. 1984 66 p
(Contract N00014-79-C-0066)
(AD-A149690) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report describes an infrared scanning system which allows almost any Navy P-3 aircraft to be used to obtain maps of sea-surface temperature (SST), and can thus be readily used to provide SST data for many oceanographic experiments. Although a few minor changes need to be made (e.g., adjusting the low-pass filter of the video, and completing the realtime data display software), the device is essentially ready to be put into use. This scanning system will probably be most helpful when operated as part of a larger program, and in areas demanding either frequent coverage, or long flight times. The scale of the phenomena under investigation should probably be at most 50-100 km, and SST should, of course, be indicative of the dynamics of the processes. Such a system would seem to be almost essential to a research program when the SST gradients are sharp, and changing rapidly in time. The sensing device is mounted in a wing pod, and the data are sent optically to recording equipment located in the cabin. The system can be installed on a P-3 in a few hours, and involves no airframe modifications. It has been tested in flight only minor changes are needed to make it fully operational. GRA

N85-22144# Science Applications, Inc., McLean, Va. Electrooptics Technology Div.
TECHNICAL SUPPORT FOR MICROWAVE EXPERIMENTS ON THE EYE LENS Final Report, 1 Mar. 1980 - 1 Mar. 1984
N. C. Wyeth Mar. 1984 46 p
(Contract DAMD17-80-C-0057)
(AD-A149702) Avail: NTIS HC A03/MF A01 CSCL 06/18

A research program at Walter Reed Army Institute of Research (WRAIR) is concerned with the mechanism by which microwave exposure produces cataracts in the eye lens. Science Applications, Inc. (SAI) has supported WRAIR personnel in system design, equipment assembly, and operation of experiments to measure the physical effects in the eye lens as it is subjected to microwave pulses of varying peak power levels. SAI also developed theoretical models for the thermoacoustic wave phenomena involved and the vibrational motion of the eye lens. GRA

N85-22145# Parke Mathematical Labs., Inc., Carlisle, Mass.
TOPICS IN OPTICAL MATERIALS AND DEVICE RESEARCH, 3: VOLUME 1 Final Technical Report, Dec. 1980 - Dec. 1983
T. B. Barrett, R. Marshall, C. Warde, J. Caulfield, and M. M. Salour Griffiss AFB, N.Y. RADC Aug. 1984 127 p
(Contract F19628-81-C-0052)
(AD-A149726; RADC-TR-84-73-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 17/8

This report provides a partial summary of work accomplished in four diverse areas associated with optical materials and optical signal processing. Chapter 1 describes experimental techniques used for the evaluation of a substrate (polycrystalline indium phosphide) which is used in optical signal processing devices. The effect of various crystal growth procedures on the semiconducting properties of indium phosphide is summarized. Chapter 2 describes attempts to experimentally isolate the origin of the photorefractive effect in the important photorefractive material, bismuth silicon dioxide. Chapter 3 describes an optical technique for unidirectional light, switching. GRA

N85-22146# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
DETERMINING OBJECT ORIENTATION FROM A SINGLE IMAGE USING MULTIPLE INFORMATION SOURCES Interim Report
N. J. Foster and A. C. Sanderson Jun. 1984 103 p
(AD-A149980; CMU-RI-TR-84-15) Avail: NTIS HC A06/MF A01 CSCL 20/6

Three techniques are presented which use assumptions about the real world to determine the orientation of objects from a single visual image. The orientation information from each of these techniques is combined to provide a more accurate estimate of object orientation. This algorithm is applied to the task of estimating the orientation of a single transistor against a uniform, but contrasting background. Three techniques are proposed for estimating object orientation. Histogram Template Matching employs a nearest-neighbor classifier using the normalized correlation function as a distance measure between the histogram of the input image and a set of training histograms. Binary Connectivity Analysis analyzes the connectivity of an object's silhouette and uses the resulting image features to determine orientation. Ellipse Fitting uses the parameters of an ellipse in the image to specify the orientation of the corresponding circular object surface, and location of the image intensity gradients. GRA

N85-22147# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
MULTIPLE RESOLUTION REPRESENTATION AND PROBABILISTIC MATCHING OF 2-D GRAY-SCALE SHAPE Interim Report
J. L. Crowley and A. C. Sanderson Dec. 1984 33 p Sponsored in part by Westinghouse Electric Corp.
(Contract F49620-83-C-0100)
(AD-A149981; CMU-RI-TR-84-29) Avail: NTIS HC A03/MF A01 CSCL 17/8

One approach to pattern classification is to match a structural description of a pattern to models which describe the structural properties of pattern classes. The central problem in structural pattern matching is to determine the correspondence between the symbols which comprise a model and symbols which describe a pattern. The difficulty of determining this correspondence depends critically on the representation that is used to describe patterns. This paper presents a probabilistic representation for structural models of pattern classes. Both pattern descriptions and models for pattern classes are based on symbols which represent gray-scale information at multiple resolutions. A pattern description is given by a tree of symbols with attribute values. Structural models are represented by a tree of symbols with probabilistic attributes. The position and scale (resolution) of the

symbols, as well as other features, are represented by these attributes. An algorithm is presented for determining the correspondence between symbols in a description of a pattern and symbols in a model of a pattern class. This algorithm uses the connectivity between symbols at different scales to constrain the search for correspondence. An interactive training program for learning models of pattern classes is described, and some conclusions from the work are presented. Author (GRA)

N85-22148# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
PROCESSING DYNAMIC IMAGE SEQUENCES FROM A MOVING SENSOR Ph.D. Thesis
D. T. Lawton Feb. 1984 201 p
(Contracts N00014-75-C-0459; N00014-82-K-0464)
(AD-A149984; AD-E001789; COINS-TR-84-05) Avail: NTIS HC A10/MF A01 CSCL 17/8

A fundamental problem in motion processing research has been the discrepancy between the precision and reliability with which image displacements can be determined and the sensitivity of inference procedures to noise and resolution errors. There are also indications that these inference procedures are inherently unstable and, in some cases, ambiguous. The approach of this thesis has been to deal with restricted cases of motion for which the inference of the motion parameters, image displacements, and environmental depth, can be combined into a single, uniform, and mutually constraining computation. These restricted cases of motion are sufficient for a wide range of real-world tasks, especially since other associated sensing devices can be used to ascertain the other parameters of motion. The author then applys the procedure developed for translational motion to local portions of image sequences to process general sensor motion as if it were composed of independent local environmental translations. The resulting representation can considerably simplify the processing of less restricted and general motion. GRA

N85-22149# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
PROPERTIES OF CHIRPED GRATING LENSES IN OPTICAL WAVEGUIDES Final Report, 1 Oct. 1983 - 30 Sep. 1984
W. S. C. Chang 1 Oct. 1984 21 p
(Grant AF-AFOSR-0037-80)
(AD-A150023; AFOSR-84-1219TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Chirped gratings can be used as lenses on optical waveguides. Efficiency as high as 85% can be obtained. However, combined high efficiency and low F-number or combined high efficiency and large angular field of view can only be obtained with careful considerations given to the design, the materials and the fabrication process. In this report, we will summarize the research results obtained at UCSD on the fundamental limitations of their performance in efficiency, angular field of view and F-number caused by diffraction, materials properties and fabrication techniques for various lens designs and F-numbers. GRA

N85-22150# Ohio State Univ., Columbus. ElectroScience Lab.
THE EFFECTS OF ATMOSPHERIC WATER VAPOR ON INFRARED PROPAGATION Final Report, 1 Jun. 1981 - 30 Nov. 1983
R. K. Long and E. K. Damon Sep. 1984 5 p
(Contract DAAG29-81-K-0084)
(AD-A150030; ESL-713774-5; ARO-17603.2-GS) Avail: NTIS HC A02/MF A01 CSCL 20/6

The goal of this project was to obtain experimental water vapor absorption data using long path absorption cells. One experiment used a frequency doubled CO2 laser source to obtain data at specific frequencies near 5.2 micrometer. The second experiment collected high resolution (.06/cm) Fourier transform spectra over the 500-5000/cm band for pure and nitrogen broadened samples. It was planned to use these data to improve the far-wing line shape model. GRA

N85-22151# Dayton Univ., Ohio.
AN ITERATION METHOD FOR COMPLEX SCATTERING PROBLEMS Interim Report, 15 May 1983 - 15 May 1984
M. Kaye, P. K. Murthy, and G. A. Thiele Griffiss AFB, N.Y. RADC Oct. 1984 59 p
(Contract F19628-83-K-0034)
(AD-A150038; UDR-TR-81; RADC-TR-84-204) Avail: NTIS HC A04/MF A01 CSCL 20/6

An iteration method for solving an integral representation of Maxwell's equation is presented. In this method, the scattering body is divided into lit and shadow side regions separated by the geometric optics boundary. The total current at any point on the surface of the scatter, induced by an incident field, is the sum of an approximate optics current and a correction current. Both of these currents are computed by iteration. The general theory is presented and applied to the problem of scattering from a two-dimensional square cylinder. The results are compared with the method of moments and excellent agreement is obtained. Due to its structure, the iteration method, unlike the method of moments, does not give spurious results at internal resonances of the scatter. The method is applicable to complex structures and can be used for non-perfect conductors. GRA

N85-22152# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
DESIGN OF AN OPTICAL PROXIMITY SENSOR USING MULTIPLE CONES OF LIGHT FOR MEASURING SURFACE SHAPE Interim Report
M. Fuhrman and T. Kanade Apr. 1984 30 p
(Contract N00014-81-K-0503)
(AD-A150050; CMU-RI-TR-84-17) Avail: NTIS HC A03/MF A01 CSCL 20/6

A noncontact multi-light source optical proximity sensor which can measure the distance, orientation, and curvature of a surface has been developed. Beams of light are sequentially focused from the ends of fiber optic cables onto a target surface. An analog light-sensor- a planar PIN diode area sensor chip - measures the position of the spots of light on the surface, and the 3-D locations of the spots are computed by triangulation. By fitting a surface to a set of points, the distance, orientation and curvature of the target surface is calculated. The number of light sources, and their positions and orientations were chosen so that the uncertainty in the measurement of distance would be within 0.05 mm and the uncertainty in surface orientation would be within 1.0 deg. Since there are no moving parts and the spot position sensor chip outputs the position of the spot directly without scanning its field of view, fast operation of the proximity sensor can be realized. Earlier prototype versions of the sensor can give approximately 1000 measurements of distance and 1.5 degrees for surface orientation. This proximity sensor will be useful for such applications as tracing an object surface by a robot manipulator with a specified distance and orientation relative to the surface. Author (GRA)

N85-22153# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
SWITCHABLE ZERO ORDER DIFFRACTION GRATINGS AS LIGHT VALVES Semiannual Report, 1 Apr. - 30 Sep. 1984
John Melngailis 1 Nov. 1984 5 p
(Contract N00014-84-K-0073)
(AD-A150129) Avail: NTIS HC A02/MF A01 CSCL 20/6

The aim of this project is to fabricate a light valve which operates on the principle of the cancellation of the zero order of diffraction. The light valve consists of two facing aligned phase gratings in a transparent medium. Displacing one grating with respect to the other by one-half of one grating period switches the valve from a transmitting to an absorbing state. The light valve is to be about 1-2 mm square and be mass producible into matrix addressable arrays. Arrays of this type can operate as displays or as spatial light modulators for optical signal processing. We have chosen to fabricate the light element using polyvinylidene fluoride (PVF2) which is a transparent piezoelectric. The gratings are embossed into the plastic and the piezoelectricity is used to produce the motion needed for switching. GRA

N85-22154# Brookhaven National Lab., Upton, N. Y.
INTENSE, BROADBAND, PULSED I-R SOURCE AT THE NATIONAL SYNCHROTRON LIGHT SOURCE
Gwyn P. Williams 1984 10 p refs Presented at the IEEE Conf. on Infrared and Submillimeter Waves, Miami, 12-14 Dec. 1984
(Contract DE-AC02-76CH-00016)
(DE84-010542; BNL-34491; CONF-841214-1) Avail: NTIS HC A02/MF A01

A broadband (1 micron to 1 mm) synchrotron radiation infrared source, pulsed each 20 to 180 nseconds and delivering about 10 to the 15th power photons/sec/1% bandpass into f10 optics is described. The source size is diffraction limited. This source is thus 100 to 1000 times brighter than a 2000 R black body, very stable and capable of being used for calibration. DOE

N85-22155# California Univ., Los Angeles.
THE FUTURE OF LIGHTWAVE TECHNOLOGY
Michael Bass and Elsa Garmire 1984 71 p refs Presented at the NSF Workshop on Quantum Electron., held in Los Angeles, 31 Jan. - 2 Feb. 1984
(Grant NSF OIR-83-14417)
(PB85-109759; NSF/OIR-84004) Avail: NTIS HC A04/MF A01 CSCL 20F

A workshop held to identify future research and applications topics in quantum electronics/lightwave technology and to identify the facilities needed to work in this field is described. Among the applications to lightwave technology addressed are optical signal processing, opto-electronics, optical communications, fiber optic sensors, and precision measurements. Laser research and development is examined, with emphasis on new lasers, high power lasers and materials, optical thin films, semiconductor diode lasers, ultrashort-pulse lasers, new solid state lasers, free electron lasers, and UV, VUV, and XUV lasers. The need for interaction between systems engineers and research scientists is cited, and the use of facilities which encourage this interaction is urged. Author

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-22156 Department of the Air Force, Washington, D.C.
RF-PRIMED HIGH POWER HALOGEN VIAL APPARATUS Patent
H. Goldie and W. D. Cherry, inventors (to Air Force) Issued 29 Jan. 1985 5 p Supersedes AD-D009842
(AD-D011545; US-Patent-4,496,917; US-Patent-Appl-SN-422430; US-Patent-Class-333-13) Avail: US Patent and Trademark Office CSCL 19/1

A high power halogen-filled vial stage receiver protector utilizing an RF priming source in conjunction with a pair of circular guides to provide a continuous supply of priming free electrons to the halogen gas-filled plasma limiter vial is disclosed. GRA

N85-22157# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SUPPRESSION OF TILTING INSTABILITY OF A COMPACT TORUS BY ENERGETIC PARTICLE BEAMS
Yasuyuki Nomura Nov. 1984 37 p refs
(IPPJ-705) Avail: NTIS HC A03/MF A01

The tilting instability of a compact torus can be suppressed by toroidally circulating energetic particle beams. The stabilizing mechanism is based on the properties of the forced oscillation in the motion of beam particles in a plasma ring. It is estimated that the required beam current for the stabilization is sufficiently small compared to the plasma current in the case that the angular velocity of beam particles is close to the betatron frequency. This stabilizing method is applied to a field reversed configuration. Effects of the plasma surface current and beam divergences are also examined. E.A.K.

N85-22158# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HEAT FLUX IN LORENTZIAN PLASMA
M. Ogasawara, M. Ishikawa, and A. Fukano Nov. 1984 16 p refs
(IPPJ-704) Avail: NTIS HC A02/MF A01

The linear analysis by the six-moment method proposed by Shirazian for calculating the heat flux in a steep temperature gradient plasma is extended to the second order. The heat flux is expressed in terms of a ratio (inverse of Knudsen number) L/lambda, L and lambda are the scale length of the temperature gradient and the mean free path. In the collisional and small temperature gradient limit, the second order heat flux is Q = 0.1416*1--(9/52)(1-R sub t, sup 2)*2/(3-R sub t)*2/(1+R sub t)] sup 5/2 Q sub L, where q sub L is the exact result derived by Landshoff for the Lorentzian plasma and R sub t=T sub c/Tsub H, where T sub H and T sub C are the temperatures of hot and cold walls. The discrepancy between q and q sub L comes from the lack of number of moments and the assumed form of the electron velocity distribution function. A new trial distribution function including eight moments is proposed which may be more appropriate for the Lorentzian plasma. A criterion for the choice of good trial function is proposed and tested. M.G.

N85-22159# Nagoya Univ. (Japan). Inst. of Plasma Physics.
RECONSIDERATION OF SHEATH RELATED TO NEGATIVE ION EXTRACTION
Kouichi Jimbo (Kyoto Univ., Japan) Nov. 1984 28 p refs
(IPPJ-706) Avail: NTIS HC A03/MF A01

A sheath formation is reconsidered relevant to the negative ion extraction from a plasma. It is assumed that the sheath is created so that the plasma becomes in thermal equilibrium with the wall. Stable electrostatic oscillations exist inside the sheath. The plasma is stable against the ion acoustic instability in the sheath, and the Bohm sheath criterion is obtained automatically. The sheath created across the magnetic field is stable against the drift instability, since the diagmagnetic current, which excites the drift instability, does not flow inside the sheath. The electrostatic field in the sheath is obtained. It is found that the space charge potential in the sheath created across the magnetic field is very weak compared to the case without the magnetic field. R.J.F.

N85-22160# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EFFICIENT HEATING AND CONFINEMENT OF IONS IN AN AXISYMMETRIC MAGNETIC MIRROR SUPPLEMENTED WITH dc ELECTRIC FIELD
Y. Nishida, H. Mase, and K. Ishii Dec. 1984 32 p refs
(IPPJ-707) Avail: NTIS HC A03/MF A01

Strong heating and improved confinement of ions was observed in an axisymmetric magnetic mirror field supplemented with an electrostatic dc field across and along the magnetic field lines. The increased life time of ions is the trapping of ions in the electrostatic potential well in the magnetic mirror field. The efficient heating of ions resulted from the thermalization through weak collisions and/or finite correlation time of the strong EXB type instabilities excited by the radial current flowing into the outer electrode. The ion temperature increases in proportion to (V sub H) sup 2), the square of the applied dc voltages for heating. E.A.K.

N85-22161# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STRONG IRON ACCELERATING BY COLLISIONLESS MAGNETOSONIC SHOCK WAVE PROPAGATING PERPENDICULAR TO A MAGNETIC FIELD
Yukiharu Ohsawa Dec. 1984 29 p refs
(IPPJ-709) Avail: NTIS HC A03/MF A01

A 2-1/2 dimensional fully relativistic, fully electromagnetic particle code is used to study a time evolution of nonlinear magnetosonic pulse propagating in the direction perpendicular to a magnetic field. The pulse is excited by an instantaneous piston acceleration, and evolves totally self-consistently. Large amplitude pulse traps some ions and accelerates them parallel to the wave front. They are detrapped when their velocities become of the order of the sum of the E x B drift velocity and the wave phase

velocity, where E is the electric field in the direction of wave propagation. The pulse develops into a quasi-shock wave in a collisionless plasma by a dissipation due to the resonant ion acceleration. Simple nonlinear wave theory for a cold plasma well describes the shock properties observed in the simulation except for the effects of resonant ions. In particular, magnitude of an electric potential across the shock region is derived analytically and is found to be in good agreement with our simulations. The potential jump is proportional to B squared, and hence the E x B drift velocity of the trapped ions is proportional to B. Author

N85-22162# Aeronautical Research Labs., Melbourne (Australia).
PLASMA MASS AND EFFECTIVE INDUCTANCE IN A SMALL RAINBOW
A. J. Bedford Nov. 1984 15 p refs
(MRL-R-947; AR-004-195) Avail: NTIS HC A02/MF A01

A series of firings of a small caliber plasma-driven electromagnetic railgun are described in which copper, aluminium, and zinc foils are used to initiate the plasma. Three different masses of each type of foil are used. Projectile displacement-time profiles in the railgun bore are constructed from streak camera records and calculations based on experimental current vs time records are made to obtain effective inductance per unit length values (L' sub eff) for each firing. The effects of foil mass amd species, plasma voltaye and plasma leakage past the projectile are discussed in relation to the calculated L' sub eff values. M.G.

N85-22163# Naval Research Lab., Washington, D. C.
DYNAMICS OF SPACE CHARGE WAVES IN THE LASER BEAT WAVE ACCELERATOR
C. M. Tang, P. Sprangle, and R. N. Sudan 30 Jan. 1985 50 p
(Contract DE-AI05-83ER40117)
(AD-A149688; NRL-MR-5324) Avail: NTIS HC A03/MF A01 CSCL 20/9

The excitation of plasma waves by two laser beams, whose frequency difference is approximately the plasma frequency, is analyzed. Our nonlinear analysis is fully relativistic in the axial and transverse directions and includes mismatching of the laser beat frequency to the plasma frequency, time dependent laser amplitudes, and an applied transverse magnetic field (surfatron configuration). Our analytical results for the large amplitude plasma waves includes an axial constant of motion, accelerating electric field, and its phase velocity. The analytical results in the weak laser power limit are in good agreement with numerical results obtained from the complete equations. The imposed transverse magnetic field is found to increase the effective plasma frequency, but has little effect on the plasma dynamics. Author (GRA)

N85-22164# Oak Ridge National Lab., Tenn.
ELECTROSTATIC CONFINEMENT IN A BUMPY TORUS
A. M. El Nadi Nov. 1984 24 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003794; ORNL/TM-9219) Avail: NTIS HC A02/MF A01

In a closed-field-line device such as a bumpy torus, the combined E x B and del B drifts lead to charge separation that is balanced by the ion polarization drift. Self-consistent potential and density profiles and the condition for electric island formation are determined. DOE

N85-22165# GA Technologies, Inc., San Diego, Calif.
DETERMINATION OF EXPERIMENTAL TOKAMAK PLASMA PROPERTIES USING MAXIMUM ENTROPY ANALYSIS
G. A. Cottrell, E. S. Fairbanks, and R. E. Stockdale Sep. 1984 15 p refs Presented at the 5th APS Topical Conf. on High Temp. Plasma Diagn., Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AT03-84ER-51044)
(DE85-001723; GA-A-17703; CONF-840922-14) Avail: NTIS HC A02/MF A01

The diagnostician commonly faces the challenge of extracting the maximum information on plasma spatial profiles from a very limited and noisy data set. Conventionally, functional forms (e.g., a parabola raised to a power) are fitted to the measured data using nonlinear least-squares regression. This immediately biases the interpretation and constrains results to a narrow family of curves for which there may be no real evidence in the data. The consequences of abandoning this assumption are examined and the constrained Maximum Entropy (ME) profile making no such assumptions is sought. Results are compared with conventional analysis. The ME method has the inherent advantages of: (1) yielding only positive (and therefore physically meaningful) profiles; (2) suppression of noise on the data; and (3) producing a profile which contains the least amount of spurious detail. The method is illustrated with reference to measured chord-average CO2 laser interferometer data taken on the Doublet III Tokamak. DOE

N85-22166# Argonne National Lab., Ill. Fusion Power Program.
TRITIUM CATALYZED DEUTERIUM TOKAMAKS
Ehud Greenspan (Nuclear Research Center-Negev, Beer-Sheva, Israel), George H. Miley (Illinois Univ., Urbana), J. Jung, and J. Gilligan Apr. 1984 62 p refs
(Contract W-31-109-eng-38)
(DE85-004825; ANL/FPP-TM-183) Avail: NTIS HC A04/MF A01

A preliminary assessment of the promise of the Tritium Catalyzed Deuterium (TCD) Tokamak power reactors relative to that of deuterium-tritium (D-T) and catalyzed deuterium (Cat-D) Tokamak is undertaken. The TCD mode of operation is arrived at by converting the (3)He from the D(D,n) (3)He reaction into tritium, by neutron capture in the blanket; the tritium thus produced is fed into the plasma. There are three main parts to the assessment: blanket study, reactor design and economic analysis and an assessment of the prospects for improvements in the performance of TCD reactors (and in the promise of the TCD mode of operation in general). DOE

N85-22167# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
NEGATIVE LITHIUM EMISSION FROM A TUNGSTEN SURFACE IN A PLASMA
J. W. Stearns and R. V. Pyle Oct. 1984 7 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3-7 Dec. 1984
(Contract DE-AC03-76SF-00098)
(DE85-003456; LBL-18016; CONF-841218-7) Avail: NTIS HC A02/MF A01

Three possibilities for making Li(-) ions were considered: electron capture in a suitable gas or vapor, extraction from a lithium plasma, and production on a low work function surface in a plasma. The only quantitative results, so far, are for electron capture, with the highest yield being about 5% for Li(+) in Cs vapor at 5 keV. Of the other two methods, some Li(-) was produced in the volume of a plasma. The observation of Li(-) from a surface in a He-Li plasma is reported. DOE

N85-22168# Oak Ridge National Lab., Tenn.
PLASMA PERFORMANCE OF TFCX AND JET WITH SAWTOOTHING
L. M. Hively and D. R. Mikkelsen 1984 17 p refs Presented at Meeting of the Plasma Div. of the Am. Physical Soc., Boston, 27 Oct. 1984
(Contract DE-AC02-76CH-03073)
(DE85-003335; CONF-841010-11) Avail: NTIS HC A02/MF A01

Nominal copper TFCX; transport assumptions; transport model; electron confinement; sawtoothing; long pulse current evolution; and plasma operation contours plots are given. B.G.

N85-22169# Argonne National Lab., Ill. Energy and Environmental System Div.
EXPERIMENTAL INVESTIGATIONS OF THERMAL RADIATION FROM POTASSIUM ATOMS IN MAGNETOHYDRODYNAMIC SYSTEM: PRELIMINARY REPORT
Chi S. Wang, Lorac S. H. Chow, and Terry R. Johnson Sep. 1984 29 p refs
(Contract W-31-109-eng-38)
(DE85-003715; ANL/EES-TM-267) Avail: NTIS HC A03/MF A01

The effect of potassium atoms on gas radiation was experimentally investigated. Test data were interpreted by a radiant heat

transfer model that calculates the effective gas emissivity and absorptivity from carbon dioxide, water vapor, and potassium atoms and the resulting heat flux. Combustion tests both with and without potassium were conducted. For combustion gases without potassium, the gas emissivities calculated using the model were in good agreement with those obtained from the Hottel charts. For combustion gases with potassium, the radiant heat fluxes calculated using the model were in reasonable agreement with the measurements. Using the partially validated radiant heat transfer model, calculations were performed to provide gas emissivity data (from carbon dioxide, water vapor, and potassium atoms) for magnetohydrodynamic components with mean beam lengths up to 9.1 m (30 ft). DOE

N85-22170# Johns Hopkins Univ., Baltimore, Md.
SPECTROSCOPIC STUDY OF SOURCES AND CONTROL OF IMPURITIES IN TMX-U: REVISION 1
T. L. Yu, S. L. Allen (Lawrence Livermore National Lab.), and H. W. Moos Nov. 1984 21 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3-7 Dec. 1984
(Contracts DE-AC02-76ET-53006; W-7405-eng-48)
(DE85-004423; UCRL-90949-Rev-1; CONF-841218-14) Avail: NTIS HC A02/MF A01

Two absolutely calibrated EUV instruments were used to study the impurity characteristics in the Tandem Mirror Experiment-Upgrade (TMX-U). One instrument is a spectrograph that measures the time histories of several impurity emission lines in a single plasma shot. The other instrument is a monochromator that measures time-resolved radial profiles of a particular impurity emission line. The common intrinsic impurities found in TMX-U are C, N, O, and Ti. It is shown that a large fraction of oxygen and nitrogen in the plasma is associated with the neutral beams. The plasma wall is the main source of carbon. In general, the concentration of each of the impurities is low (< 1%), and the power radiated by them is less than 10 kW, which is a small portion of the total input power to the plasma. The concentrations of the impurities can be reduced substantially by glow discharge cleaning and titanium gettering. DOE

N85-22171# Wisconsin Univ., Madison. Fusion Engineering Program.
PRESSURE-GRADIENT-DRIVEN TOKAMAK RESISTIVE MHD INSTABILITY IN THE BANANA-PLATEAU COLLISIONALITY REGIME
J. D. Callen and K. C. Shaing (ORNL) Nov. 1984 52 p refs
(Contracts DE-AC02-80ER-53104; DE-AC03-84OR-21400)
(DE85-004568; UWFDM-577) Avail: NTIS HC A04/MF A01

The moment equation approach to neoclassical processes is used to derive the linearized electrostatic perturbed flows, currents and resistive MHD-like equations for a Tokamak plasma. The new features of the resultant neoclassical MHD, which requires a multiple length scale analysis for the parallel eigenfunction but is valid in the experimentally relevant banana-plateau regime of collisionality, are: (1) a global Ohm's law that includes a fluctuating bootstrip current resulting from the parallel electron viscous damping of the poloidal flow due to the perturbed radial pressure gradient; (2) reduction of the curvature effects to their flux surface average because Pfirsch-Schlueter currents cancel out the lowest order geodesic curvature effects; and (3) an increased polarization drift contribution with B(-2) replaced by B(-2) sub theta were B sub theta is the poloidal magnetic field component. An electrostatic eigenmode equation is determined. For the unstable fluid-like eigenmodes the new viscous damping effects dominate (by epsilon/sup -3/2/) over the curvature effects, but the growth rates still scale roughly like resistive-g or resistive-ballooning modes. Diamagnetic drift frequency corrections to these new modes are also discussed. DOE

N85-22172# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATIONS OF BULK ELECTRON HEATING DUE TO RETURN CURRENT IN A TOKAMAK DISCHARGE STARTED UP BY LOWER HYBRID WAVES
K. Toi, K. Ohkubo, K. Kawahata, Y. Kawasumi, K. Matsuoka, N. Noda, I. Ogawa, Y. Ogawa, K. Sato, and S. Tanahashi Dec. 1984 13 p refs
(IPPJ-708) Avail: NTIS HC A02/MF A01

A rapid heating of bulk electrons due to return current is observed during the current-rise phase in the JIPP T-IIU Tokamak discharge which is initiated and driven by lower hybrid waves. However, the effect of the return current on the rise of a net plasma current is small in the discharge where a rise time of RF-driven current is considerably longer than a resistive diffusion time of the bulk plasma. Author

N85-21552# Joint Publications Research Service, Arlington, Va.
SIMULATION OF THERMAL AND ELECTROMAGNETIC PROCESSES IN INDUCTION PLASMATRONS Abstract Only
Boris Sergeyevich Polevodov, Viktor Boleslavovich Demidovich, and Yuriy Alekseyevich Skvortsov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 27 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 13-21 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21553# Joint Publications Research Service, Arlington, Va.
REDUCING ELECTRIC POWER LOSSES IN DISCHARGE CHAMBER OF INDUCTION PLASMATRON Abstract Only
Viktor Ivanovich Borisenkov, Sergey Vyacheslavovich Dresvin, and Lev Aleksandrovich Kuzmin *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 28 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 21-27 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-21554# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF MULTIARC PLASMA DEVICES Abstract Only
Valeriy Stepanovich Klubnikin and Benedikt Girgoryevich Smirnov *In its* USSR Rept.: Electron. and Elec. E Eng. (JPRS-UEE-85-004) 5 Mar. 1985 p 29 Transl. into ENGLISH from Izv. Vysshikh Uch. Zaved.: Elektromekhanika (USSR), no. 9, Sep. 1984 p 27-33 (For primary document see N85-21531 12-33)
Avail: NTIS HC A04/MF A01

N85-22280# Abastumani Astrophysical Observatory, Georgia (USSR).
ON THE SPECTRUM OF LONGITUDINAL WAVES IN THE HOT DEGENERATE PLASMA
J. G. Lominadze, G. I. Melikidze, V. P. Silin (Academy of Sciences, Moscow), and V. N. Ursov (Academy of Sciences, Moscow) *In* ESA Plasma Astrophys. Nov. 1984 p 101-103 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22295# Universidad Politecnica de Madrid (Spain). Dept. de Energia Nuclear.
OPACITY DETERMINATIONS FOR INERTIAL CONFINEMENT FUSION (ICF) MATERIALS USING AN AVERAGE ATOM MODEL
G. Velarde, J. M. Aragones, C. Cabezudo, J. J. Honrubia, J. M. Martinez-Val, E. Minguez, J. L. Ocana, J. M. Perlado, and J. F. Serrano *In* ESA Plasma Astrophys. Nov. 1984 p 201-204 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22296*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRON-POSITRON PAIR EQUILIBRIUM IN STRONGLY MAGNETIZED PLASMAS
A. K. Harding *In* ESA Plasma Astrophys. Nov. 1984 p 205-208 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 20I

N85-22297# Tokyo Univ. (Japan). Nobeyama Radio Observatory.

ELECTRON-POSITRON PAIRS IN A MILDLY RELATIVISTIC PLASMA IN ACTIVE GALACTIC NUCLEI
F. Takahara and M. Kusunose *In* ESA Plasma Astrophys. Nov. 1984 p 209-212 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22299# Jagellonian Univ., Cracow (Poland). Astronomical Observatory.
PLASMA IN THE CLUSTERS OF GALAXIES
A. Michalec *In* ESA Plasma Astrophys. Nov. 1984 p 223-224 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22301# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PLASMA PROCESSES IN HERBIG-HARO OBJECTS
I. Axnaes, N. Brenning, and G. F. Gahm *In* ESA Plasma Astrophys. Nov. 1984 p 229-233 refs Sponsored by Swedish Natural Science Research Council (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22305# Turin Univ. (Italy). Ist. di Fisica Generale.
MAGNETOHYDRODYNAMIC (MHD) TURBULENCE IN RADIO GALAXIES
L. Zaninetti and G. Pelletier (Grenoble Univ., France) *In* ESA Plasma Astrophys. Nov. 1984 p 243-246 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22306# Ecole Polytechnique, Palaiseau (France).
ABOUT STATIC AND DYNAMIC SOLUTIONS OF THE ALIGNED ROTATOR MODEL
E. Asseo, D. Beaufils, and R. Pellat *In* ESA Plasma Astrophys. Nov. 1984 p 247-250 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22307# International School for Advanced Studies, Trieste (Italy).
HYDRODYNAMICS OF ASTROPHYSICAL JETS
R. Turolla, M. Calvani (Padua Univ.), and L. Nobili (Padua Univ.) *In* ESA Plasma Astrophys. Nov. 1984 p 251-253 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22308# Bonn Univ. (West Germany). Inst. fuer Astronomische.
VISCOUS JETS
M. Nepveu *In* ESA Plasma Astrophys. Nov. 1984 p 255-257 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22309# Turin Univ. (Italy). Ist. di Fisica Generale.
JETS IN GALAXIES
A. Ferrari *In* ESA Plasma Astrophys. Nov. 1984 p 259-273 refs Sponsored by CNR and MPI (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22311*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ARGUMENTS FOR FUNDAMENTAL EMISSION BY THE PARAMETRIC PROCESS L YIELDS + S IN INTERPLANETARY TYPE III BURSTS
I. H. Cairns *In* ESA Plasma Astrophys. Nov. 1984 p 281-284 refs Sponsored by Sydney University Research Traveling Scholarship (For primary document see N85-22270 12-90)
(Contract NAS5-26819; Grant NGL-16-001-043)
Avail: NTIS HC A15/MF A01 CSCL 20I

N85-22315# Katholieke Universiteit te Leuven (Belgium). Astronomisch Inst.
THE CONTINUOUS SPECTRUM OF AN AXISYMMETRIC, SELF-GRAVITATING EQUILIBRIUM IN THE PRESENCE OF A POLOIDAL MAGNETIC FIELD
D. Hermans, M. Goossens, and S. Poedts *In* ESA Plasma Astrophys. Nov. 1984 p 297-300 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-22173# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Div.
A REMOTE SOURCE SYSTEM FOR MEASURING RELATIVE POSITRON ANNIHILATION LINE WIDTHS IN INDIVIDUAL SLAB CYLINDRICAL SAMPLES
C. F. Coleman and F. A. Smith 1984 46 p refs
(AERE-R-10549) Avail: Issuing Activity

Positron annihilation line width measurements are usually carried out with two plane-faced samples sandwiching a positron source, an arrangement which severely constrains the range of usable sample shapes. A system is described in which a single sample is exposed in air to a collimated beam of positrons from a remote source, so that the sample can be in the ferm of a rod or slab of suitable shape for use in mechanical damage or fatigue test programs. With the system is associated a rotary sample changer, set up so that long runs on up to four samples can be broken up into a series of interleaved short runs, so minimizing the effects of electronic gain shifts in comparative measurements. A particle filter is incorporated to prevent scattered positrons from annihilating in close proximity to the detector. Annihilations in the filter still provide the main source of background counts in the detector (approx. 10%) but the filter material has known and to some extent selectable annihilation characteristics. Methods for determining both this background and the background due to scattering of the intense annihilation flux generated close to the source are described. Author

N85-22174# Polish Academy of Sciences, Warsaw.
NUCLEATION OF PHASE TRANSITIONS IN THE VICINITY OF PHASE BOUNDARY. PART 1: COMPARISON OF VARIOUS IDOLATED MECHANISMS. PART 2: COUPLED CLUSTER GROWTH PROCESSES
Andrzej Ziabicki 1984 134 p refs
(N-0208-5658) Avail: Issuing Activity

The five different nucleation mechanisms possible in the vicinity of an interface are compared. The thermodynamic and kinetic aspects of nucleation are discussed. In particular, the critical conditions (temperature, concentration) are analyzed in which thermodynamic equilibrium can be reached (no nucleation), equilibrium and steady-state concentration distributions of cluster sizes, maximum free energy of cluster formation, and nucleation rates. The approach will be mostly phenomenological, without entering the atomic (molecular) sources of thermodynamic and transport parameters describing phase transition. A general formal solution of the problem, applicable to liquid/liquid, solid/solid, solid/gas, liquid/gas, and liquid/solid interfaces will be given, and some special cases discussed. B.G.

N85-22175 Department of the Air Force, Washington, D.C.
METHOD FOR THE PREPARATION OF EPITAXIAL FILMS OF MERCURY CADMIUM TELLURIDE Patent
T. E. Erstfeld, inventor (to Air Force) Issued 11 Dec. 1984 5 p Supersedes AD-D010224
(AD-D011532; US-Patent-4,487,640; US-Patent-Appl-SN-468781; US-Patent-Class-148-175) Avail: US Patent and Trademark Office CSCL 07/1

In accordance with the general concept of this invention, it has been found that high quality epitaxial films of (Hg,Cd)Te suitable

for use as infrared detectors can be grown onto cadmium telluride substrates using a double barrel reactor and the technique of passing a hydrogen halide gas over separate CdTe and HgTe2 vaporizable sources maintained at separate and distinct temperatures in the separate barrels of the reactor. The primary object of this invention is to provide a novel method for growing epitaxial films of (Hg,Cd)Te that possess a uniform gradient compositional content and are relatively free from defects. Another object of this invention is to grow epitaxial films of (Hg,Cd)Te onto a suitable cadmium telluride substrate. Still another object of this invention is to provide a novel method of depositing a (Hg,Cd)Te film by vapor phase epitaxy in which two distinct and separate vaporizable sources of reactant material are maintained at different temperatures and used in conjunction with a hydrogen halide reactant gas during the deposition and formation of the film. GRA

N85-22176 Department of the Navy, Washington, D. C.
PROCESS FOR MAKING A HETEROJUNCTION SOURCE-DRAIN INSULATED GATE FIELD-EFFECT TRANSISTORS UTILIZING DIFFUSION TO FORM THE LATTICE Patent .
H. H. Wieder and A. R. Clawson, inventors (to Navy) Issued 4 Sep. 1984 4 p Supersedes AD-D009098
(AD-D011536; US-Patent-4,468,851; US-Patent-Appl-SN-330281; US-Patent-Class-29-571) Avail: US Patent and Trademark Office CSCL 20/12

An apparatus for and a method of making heterojunction source-drain insulated gate field-effect transistors in order to obtain higher gain-bandwidth products at microwave frequencies is discussed. A semi-insulating InP semiconductor substrate is provided with a ternary alloy layer of p-type Ga0.47In0.53As, or optionally, an acceptor-doped p-type bulk of Ga0.47In0.53As can be substituted. Troughs are shaped in the substrate and layer for receiving a material lattice-matched to the n+ p-type Ga0.47In0.53As to perform as the source and drain contacts, n+ doped InP might be a suitable material. An optional method for forming the contacts calls for directing a stream of phosphine and hydrogen onto source and drain contact windows contacting the Ga0.47In0.53As which is heated to 750 C for about 15 minutes. This creates graded heterojunction source and drain contacts having a lattice-matching variable composition. GRA

N85-22177 Department of the Air Force, Washington, D.C.
PROCESS FOR THE EPITAXIAL DEPOSITION OF III-V COMPOUNDS UTILIZING A CONTINUOUS IN-SITU HYDROGEN CHLORIDE ETCH Patent
K. P. Quinlan and T. E. Erstfeld, inventors (to Air Force) Issued 18 Dec. 1984 7 p Supersedes AD-D009934
(AD-D011557; US-Patent-4,488,914; US-Patent-Appl-SN-437655; US-Patent-Class-148-175) Avail: US Patent and Trademark Office CSCL 20/12

The present invention relates, in general, to a process for depositing 3 to 4 semiconducter compounds as epitaxial films onto semiconductor substrates which are crystallographically compatible with said films. In a more particular aspect, this invention relates to a process for effecting a continuous, in situ, hydrogen chloride etch during the vapor phase epitaxial deposition of 3 to 4 mixed compounds onto semiconductor compounds. The resulting epitaxial structures find particular utility in the fabrication of double heterostructure lasers, light-emitting diodes and field effect transistors. The semiconductor compounds discussed are those which include elements from group 3 and group 4 of the Periodic Table of Elements. The components can be binary, ternary, or quaternary mixtures of any of those elements. GRA

N85-22178*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TOTAL IMMERSION CRYSTAL GROWTH Patent Application
Andrew D. Morrison, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 21 Nov. 1984 20 p
(Contract NAS7-100)
(NASA-Case-NPO-15800-2; NAS 1.71:NPO-15800-2; US-Patent-Appl-SN-674395) Avail: NTIS HC A02/MF A01 CSCL 20B

Crystals of wide band gap materials are produced by positioning a holder receiving a seed crystal at the interface between a body of molten wide band gap material and an overlying layer of temperature-controlled, encapsulating liquid. The temperature of the layer deceases from the crystallization temperature of the crystal at the interface with the melt to a substantially lower temperature at which formation of crystal defects does not occur, suitably a temperature of 200 C to 600 C. After initiation of crystal growth, the leading edge of the crystal is pulled through the layer until the leading edge of the crystal enters the ambient gas headspace which may also be temperature controlled. The length of the column of liquid encapsulant may exceed the length of the crystal such that the leading edge and trailing edge of the crystal are both simultaneously with the column of the crystal. The crystal can be pulled vertically by means of a pulling-rotation assembly or horizontally by means of a low-angle withdrawal mechanism. NASA

N85-22179# Polish Academy of Sciences, Warsaw. Instytut Podstawowych Problemow Techniki.
THEORY OF ORIENTED NUCLEATION WITH ASYMMETRIC SINGLE ELEMENTS. 2: EFFECTS OF ROTATIONAL DIFFUSION
Leszek Jarecki 1984 49 p refs
(IFTR-32/1984) Avail: NTIS HC A03/MF A01

The role of rotational diffusion of single amorphous elements in kinetics of oriented nucleation of new phase is discussed. A new theory of nucleation for systems composed of asymmetric amorphous elements and exhibiting any degree of orientation is applied. The resulting nucleation rate depends on the orientation angle. The angle-dependent kinetics of nucleation and the orientation distribution of single amorphous elements are coupled in the theory, and equation of continuity for single elements considers rotational diffusion and kinetics of transformation. Effects of coupled rotational diffusion of amorphous elements and angle-dependent nucleation rate are discussed. Suppression of the role of rotational diffusion with the increase in transformation rate leads to the other asymptotic case, and the amorphous and crystalline orientation distributions appear to be nonstationary. In the asymptotic case of totally reduced rotational diffusion effects, crystalline orientation factor for total transformation drops to the initial amorphous orientation factor. E.A.K.

N85-22180# Utah Univ., Salt Lake City.
INTERNATIONAL CONFERENCE ON DEFECTS IN INSULATING CRYSTALS
24 Aug. 1984 562 p Conf. held at Salt Lake City, 20-24 Aug. 1984
(Contract N00014-84-G-0100)
(AD-A149611) Avail: NTIS HC A24/MF A01 CSCL 20/2

Partial Contents: Free, Localized, Self-Trapped Excitons and Defect Production; Electrons and Holes: Transport, Trapping, and Recombination; Theory of Defect Structure and Properties; Defect Nomenclature; Ionic Diffusion; Slow and Fast Ionic Conductivity; Dielectric Reorientation Studies of Ionic Dipolar Complexes; Formation, Structure, and Decay of Defect Relaxed Excited States; Raman Studies of Electron-Phonon Coupling and of Defect Properties; Molecular Defects; Pure and Mixed Molecular Crystals: Order/Disorder Phenomena; Off-Center Defects and Tunneling; Properties, Potential and Applications of Defect Systems for Tunable Laser Materials; Spectroscopic and Annealing Studies Based on the Unique Properties of Laser Radiation; Magnetic Resonance and Magneto-Optical Studies of Spin Properties of Electronic Defects; Radiation Produced and their Properties; Chemical Defects and Mixtures and their Properties, Extended Defects, Dislocations, Domains, Suzuki and Ceramic Structure; Properties of Pure (Undoped and Unirradiated) Crystals; and Properties of Subsurface Regions of Crystals and Thin films. GRA

N85-22181# Illinois Univ., Urbana. Electrical Engineering Research Lab.
CHARACTERIZATION OF HIGH PURITY SI-DOPED MOLECULAR BEAM EPITAXIAL GaAs Technical Report, 1 Nov.

1983 - 1 Nov. 1984
B. J. Skromme, S. S. Bose, B. Lee, T. S. Low, T. R. Lepkowski, R. Y. DeJule, G. E. Stillman, and J. C. M. Hwang (Bell Labs, Murray Hill, N.J.) 21 Nov. 1984 51 p
(Grant AF-AFOSR-0030-83)
(AD-A149651; AFOSR-84-1233TR) Avail: NTIS HC A04/MF A01 CSCL 20/2

High purity, lightly Si-doped MBE GaAs layers have been characterized using variable-temperature Hall effect and C-V measurements, photothermal ionization spectroscopy, low-temperature photoluminescene (PL), and deep level transient spectroscopy (DLTS). The spectroscopic measurements of the residual donors and acceptors indicate that the pronounced increase in carrier concentration which is observed with increasing As flux (for a constant Ga flux) results from incorporation of additional residual S donors from the As source material, and not from reductions in the Si acceptor concentration or residual C acceptor concentration. The increase in carrier concentrations with As flux is considerably more pronounced when using an alternative source of As, which introduces both S and 3 additional donor species. The C acceptor concentration increases with As flux using either As source, although the increase is much stronger with the alternative source. The dependence of C concentration on the As source implies that the As source itself contributes at least part of the C background. The Si acceptor concentration is negligible for the range of growth conditions that were used. GRA

N85-22182# Massachusetts Inst. of Tech., Cambridge.
INVESTIGATION OF DEVICE AND ELECTRONIC INTERACTIONS IN GaAs DEVICE PROCESSING Annual Technical Report, 15 Aug. 1983 - 14 Aug. 1984
H. C. Gatos and J. Lagowski 14 Aug. 1984 11 p
(Contract F49620-83-C-0139)
(AD-A149747; AFOSR-84-1178TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

Our Investigation of Defects and Electronic Interactions Associated with GaAs Device Processing has been designed as a three year program with first year tasks focussing on the effects of thermal annealing. During this one year period (August 15, 1983 - August 14, 1984) we have modified the design of the annealing ampule in order to achieve stoichiometry controlled annealing conditions and we have completed the construction of the ultra-high purity annealing apparatus (cosponsored by a grant from (Microgravity Research Associates). Our study of as-grown and annealed GaAs crystals has led to the identification of new defect related midgap levels. We have also discovered that defect interactions in a critical temperature range 800 C to 900 C are controlled by stoichiometry and by the Fermi Energy. We have initiated a collaborative study with Avionics Laboratory of the Wright Patterson Base on ion implantation and defect characterization by the photoluminescence technique. The results of our activity are contained in this report. GRA

N85-22183# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
ANGLE-RESOLVED PHOTOEMISSION STUDY OF AuGa2 AND AuIn2 INTERMETALLIC COMPOUNDS
J. G. Nelson, W. J. Gignac, S. Kim, J. R. Lince, and R. S. Williams Dec. 1984 37 p
(Contract N00014-83-K-0612)
(AD-A150000; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/2

The (001) surfaces of AuGa2 and AuIn2 intermetallic compounds were studied using synchrotron radiation excited angle-resolved photoemission. Spectra collected for photoelectron emission normal to the sample surfaces were used to map the E versus k dispersion relation of both compounds along the delta symmetry line of the bulk Brillouin Zone. The results show that the Au 5d bands of each compound are relatively flat, but the splittings of the bands at gamma are nearly the same as for elemental Au. A surface state is also observed on each surface in a band-gap region about 6 eV below the Fermi levels of the 2 compounds. GRA

N85-22184# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
THE VALENCE- AND CONDUCTION-BAND STRUCTURE OF THE SAPPHIRE (1102) SURFACE
W. J. Gignac, R. S. Williams, and S. P. Kowalczyk Dec. 1984 50 p
(Contract N00014-83-K-0612)
(AD-A150001; TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/2

X-ray photoelectron and electron energy loss spectroscopies have been employed to investigate the valence- and conduction-band densities-of-states of the sapphire (1102) surface. The photoemission spectrum of the valence-band region has been adjusted to remove cross-section effects and compared to the recent theoretical density-of-states calculated by Ciraci and Batra. The energy loss data have been used to determine the bulk plasmon energy of sapphire, 24.0 +or- .3 eV, as well as the locations of eight regions of high conduction-band state density within 20 eV above the conduction-band minimum. One of these regions is an empty surface state 4.0 eV below the conduction-band minimum. Several high binding energy satellites in the XPS core level spectra are reported and interpreted in terms of energy losses to plasmons and interband transitions. GRA

N85-22185# Westinghouse Research and Development Center, Pittsburgh, Pa.
THIN FILM TECHNOLOGY OF HIGH-CRITICAL-TEMPERATURE SUPERCONDUCTING ELECTRONICS Annual Report, 1 Nov. 1983 - 31 Oct. 1984
J. Talvacchio, A. I. Braginski, and M. A. Janocko 1 Dec. 1984 63 p
(Contract N00014-82-C-0617)
(AD-A150010; Rept-84-9C9-TUDEV-R1) Avail: NTIS HC A04/MF A01 CSCL 09/3

During the second year of performance under this program, the atomic segregation on A15 surfaces was evaluated and resulted in Nb3Sn replacing V3Si as the tunnel junction high-Tc base electrode. A process of all-refractory test junction patterning by wet and/or reactive ion etching was implemented. Epitaxial, textured tunnel barrier structures of the form Al/Al2O3, Y/Y2O3, and Al/Al2O3/Al, have been fabricated. Tunnel junctions with Nbm Nb3Sn, and Mo-Re base and Pb-Bi counterelectrodes have been formed with the barrier structures and had excellent I-V characteristics. Junctions with Nb counterelectrodes exhibited high subgap leakage currents. The Mo(65)Re(35) alloy was found to be an ideal material for counterelectrodes having Tc=12K. GRA

N85-22186# Scientific Research Associates, Inc., Glastonbury, Conn.
SEMICONDUCTOR MATERIALS FOR HIGH FREQUENCY SOLID STATE SOURCES Final Report, Jun. 1982 - Aug. 1984
H. L. Grubin, J. P. Kreskovsky, M. Meyyappan, and B. J. Morrison 18 Jan. 1985 343 p
(Contract N00014-82-C-0697)
(AD-A150020; SRA-R85-920016-F) Avail: NTIS HC A15/MF A01 CSCL 20/12

This report summarizes the results of a study undertaken to examine the role of band structure, material characteristics, device feature size, and donor density on the electrical properties of two and three terminal submicron scale semiconductor devices. The study is based on the introduction of scaling to the space and time dependent moments of the Boltzmann transport equation. The study broadly concludes that while gallium arsenide is likely to remain the material of choice for present high speed-high frequency applications, materials with scattering rates higher than that of gallium arsenide, while retaining negative differential mobility, are to be sought after two terminal active device operation. Materials with scattering rates below that of gallium arsenide are to be sought after for three terminal operation. It is demonstrated that the significant figures of merit for FET operation should be based on the T valley mobility, rather than the high field saturated drift velocity. A hierarchy of materials choices is suggested in this study. GRA

N85-22187# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
A MIXED-BASIS BAND STRUCTURE INTERPOLATION SCHEME APPLIED TO THE FLUORITE STRUCTURE COMPOUNDS NiSi2, AuAl2, AuGa2 AND AuIn2
Sehun Kim, Jeffrey G. Nelson, and R. Stanley Williams Dec. 1984 34 p Submitted for publication
(Contract N00014-83-K-0612)
(AD-A150131; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/2

A mixed basis band structure interpolation scheme for fcc d-band metals has been extended to include fluorite structure (C2F2) compounds by incorporating more plane waves in the basis set. Since the fluorite and fcc structures belong to the same space group, the interpolation scheme originally developed for fcc d-band metals is also capable of generating fluorite band structures. The interpolation parameters for NiSi2, AuAl2, AuGa2 and AuIn2 have been determined by fitting nonrelativistic first principles calculations using a nonlinear least squares procedure. Good agreement with the first principles results is obtained up to about 5 eV above the Fermi level for a basis set containing 39 plane waves and 5 d-functions. The parameters for the intermetallic compounds containing Au were then adjusted to include the effects of spin-orbit splitting in the d-bands and to improve the agreement of the calculated density-of-states with the results of photoelectron spectra. The adjusted d-bands of AuAl2, AuGa2 and AuIn2 differ considerably from those calculated by first principles. GRA

N85-22188# Department of the Army, Washington, D. C.
NORMAL COORDINATE MONOLITHIC CRYSTAL FILTER Patent Application
A. Ballato, inventor (to Army) 11 Jan. 1984 13 p
(AD-D011496; US-Patent-Appl-SN-669147) Avail: NTIS HC A02/MF A01 CSCL 09/5

The foregoing and other objects of the invention are provided by the method and means for reducing the undesired mode couplings, improper phase and insertion loss responses as well as compensating for stress and transient temperature effects on the SC cut of quartz, for example, by aligning the electrode length, including the sides thereof, fabricated on the surfaces of the crystal plate along the direction of projection of the eigenvector (the normal coordinate), and, in the case of trapped energy monolithic filter, arranging the electrode gap so that the gap is perpendicular to the eigenvector projection. For the SC cut of quartz operating in the shear mode (c-mode) the projection angle of the eigenvector as well as the direction of the electrodes is at an angle of approximately 8.2 degrees from the X' axis of the doubly rotated cut. GRA

N85-22189# Department of the Army, Washington, D. C.
STRESS COMPENSATION CRYSTAL DEVICE Patent Application
A. Ballato, inventor (to Army) Filed 10 Jan. 1985 28 p
(AD-D011497; US-Patent-Appl-SN-690358) Avail: NTIS HC A03/MF A01 CSCL 09/1

This invention relates generally to piezoelectric crystal devices and more particularly, to high frequency, high precision quartz crystals used in applications in which shock, acceleration, and temperature stresses are present. This patent application describes a stress compensated quartz piezoelectric resonator disk. The resonator contains a thin resonator center disk and a thicker integral concentric peripheral support ring. Roughly pie-slice portions of the inner disk are cut away. The remaining bridges between the resonant disk and support ring are positioned and sized in accord with crystallographic theory so that forces applied to the support ring will not change the reasonant frequency of the disk. GRA

N85-22190# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELECTRON IMAGE SIMULATION: A COMPLEMENTARY PROCESSING TECHNIQUE
Michael A. OKeefe Aug. 1984 47 p refs Presented at the 3rd Pfeffercorn Conf., Ocean City, Md., 10 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000685; LBL-18214; CONF-8404197-1) Avail: NTIS HC A03/MF A01

At present it is difficult to use direct image processing techniques to determine the specimen structure from electron micrographs obtained using nonlinear imaging conditions, and impossible when the effects of dynamical scattering are strong (as in the case of thicker specimens). However, computing techniques are available to simulate high resolution transmission electron microscope (HRTEM) images of postulated model structures. With these techniques it is possible to confirm the validity of interpretation of recorded micrographs, to help analyze crystal defects, to characterize microscope parameters, and to determine the ranges of validity of commonly used interpretive approximations. Because processed micrographs can lead to suitable model structures and, in turn, models can indicate optimum directions for processing, the two techniques are excellent complements. DOE

N85-22191# Brookhaven National Lab., Upton, N. Y.
PROPERTIES OF Ti ALLOYED MULTIFILAMENTARY Nb3Sn WIRES BY INTERNAL TIN PROCESS
M. Suenaga, C. J. Klamut, N. Higuchi, and T. Kuroda 1984 4 p refs Presented at Appl. Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-003212; BNL-35373; CONF-840937-21) Avail: NTIS HC A03/MF A01

Influence of Ti addition to the Sn core on the critical current density J(sub c) of multifilamentary Nb3Sn wires fabricated by the internal tin process was studied. The addition (approx. 1.5 wt % Ti) improved the values of J(sub c) at very high magnetic fields over those for the pure Nb3Sn, e.g., J(sub c) approx. 140 A/sq mm at 18 T. This is 3 to 4 times greater than a similarly processed pure Nb3Sn wire and is within approx. 10% of the highest critical current density measured for the Ti alloyed bronze processed Nb3Sn wires. DOE

N85-22192# Brookhaven National Lab., Upton, N. Y.
HIGH ENERGY FACILITIES ADVANCED PROJECTS: INTRABEAM SCATTERING FOR A BEAM OF GOLD IONS
G. Parzen 26 Jun. 1984 18 p
(Contract DE-AC02-76CB-00016)
(DE85-000887; BNL-35128; RHIC-2) Avail: NTIS HC A02/MF A01

This note presents the results for the effects of intrabeam scattering of the longitudinal and transverse beam dimensions for a beam of Au nuclei at various energies corresponding to (GAMMA) = 5 to (GAMMA) = 100, and for time periods of up to 10 hours. Intrabeam scattering is the scattering of the particles in the beam from each other through the Coulomb forces that are between each pair of particles. This causes the beam dimensions to grow with longitudinally and transversely, and results in requirements for the transverse aperture and the RF acceleration system. The beam growth also affects the collider performance, as the instantaneous luminosity will decrease with time. DOE

N85-22193# Oak Ridge National Lab., Tenn. Solid State Div.
ENHANCED DIFFUSION FROM INTERSTITIAL TRAPPING DURING SOLID-PHASE-EPITAXIAL GROWTH OF SILICON ALLOYS
S. J. Pennycock and J. Narayan Aug. 1984 15 p refs Presented at the Joint Intern. Conf. on Vapor Growth and Epitaxy and Am. Conf. on Crystal Growth, Atlantic City, N.J., 16 Jul. 1984 Submitted for publication
(DE85-001265; CONF-8407102-1-Draft) Avail: NTIS HC A02/MF A01

During the recrystallization by solid-phase-epitaxial (SPE) growth of supersaturated silicon alloys, a high concentration of interstitials is trapped. These are released by subsequent beating causing a transient (greatly enhanced) diffusion of the substitutional dopant by an interstitialcy mechanism. The enhancement may be as much as five orders of magnitude over tracer values, and shows an activation energy of only 1.8 +/- 0.2 eV. Following

the transient, the interstitials condense into loops, allowing an independent estimate to be made of their concentration. From these observations. It is proposed that during ion implantation, a fraction of the implanted dopants can acquire their natural valency, and retain it as the crystallization interface passes. For group V dopants this creates the trapped interstitials, giving transient enhanced diffusion when they are released by subsequent annealing. DOE

N85-22194# Brookhaven National Lab., Upton, N. Y.
MEASUREMENT OF THE INDUCED MOMENT MAGNETIC FORM FACTOR OF A HEAVY FERMION SUPERCONDUCTOR
C. Stassis, J. D. Axe, C. F. Majkrzak, B. Batlogg, and J. Remeika Oct. 1984 13 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contracts W-7405-eng-82; DE-AC02-76CH-00016)
(DE85-004165; BNL-34527; IS-J-1513; CONF-841184-23) Avail: NTIS HC A02/MF A01

Polarized neutron scattering techniques were used to study the spatial distribution and temperature dependence of the magnetization induced in a single crystal sample of CeCu2Si2 by a magnetic field of 50 kOe. It is found that at 4.2 K > T/sub c/) the induced magnetization is predominantly of 4f electronic character. No evidence was found of any change in the magnetic form factor between 300 and 4.2 K. DOE

N85-22195# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
THE UFe4P12 AND CeFe4P12: NON-METALLIC ISOTOPES OF SUPERCONDUCTING LaFe4P12
G. P. Meisner, M. S. Torikachvili (California Univ., San Diego, La Jolla), K. N. Yang (California Univ., San Diego, La Jolla), M. B. Maple (California Univ., San Diego, La Jolla), and R. P. Guertin (Tufts Univ., Medford, Mass.) 1984 12 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27-30 Nov. 1984
(Contract W-7405-eng-36)
(DE85-003724; LA-UR-84-3486; CONF-841184-20) Avail: NTIS HC A02/MF A01

The new compound UFe4P12 is described. It was found to be isostructural to superconducting LaFe4P12 and with a lattice constant of 7.7729 A. It is also a semiconductor and shows ferromagnetic order below 3.15 K. CeFe4P12 is also a semiconductor and its magnetic susceptibility is unusually small in comparison to LaFe4P12. The semiconducting behaviors of both UF34P12 and CeFe4P12 seem anomalous and may arise from strong f-electron hybridization. DOE

N85-22196# Ames Lab., Iowa.
NEUTRON SCATTERING STUDIES OF GRAPHITE INTERCALATION COMPOUNDS
W. A. Kamitakahara Oct. 1984 4 p refs Presented at the Mater. Res. Soc. Symp., Cambridge, Mass., 1 Oct. 1984
(DE85-003079; IS-M-524; CONF-8410200-1) Avail: NTIS HC A02/MF A01

The use of neutron scattering to investigate graphite intercalation compounds (GICs) has greatly increased over the past few years. Prior to about 1980, only a single limited study on RbC8 had been published, but neutron methods are now (1984) among the more common techniques employed on GICs. Neutrons offer a number of advantages in this area. Both structural and dynamical information can be obtained, usually on the same samples in a single experiment. The information is often unique, e.g., as in the case of diffusion studies by quasi-elastic neutron scattering (QENS), and the spectroscopy of g not equal to 0 phonons. Experimental results of neutron scattering studies and lithium-graphite compounds are presented and discussed. DOE

N85-22197# Schlumberger-Doll Research, Ridgefield, Conn.
COEXISTENCE OF ANTIFERROMAGNETISM AND SPIN-GLASS ORDERING IN THE ISING SYSTEM FeO 55MgO 45Cl2
P. Wong, H. Yoshizawa, and S. M. Shapiro Oct. 1984 16 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Materials, San Diego, Calif., 27 Nov. 1984 Sponsored in part by Tokyo Univ., Japan and BNL
(Contract DE-AC02-76CH-00016)
(DE85-004164; BNL-35480; CONF-841184-21) Avail: NTIS HC A02/MF A01

Fe/sub 1-x/Mg/sub x/C12 is a diluted Ising antiferromagnet with competing first and second neighbor exchange interactions. A previous magnetization study has found that at x approx. = 0.45, the system undergoes a Neel transition at T/sub N/ approx. 7.4K which is followed by a spin-glass transition at T/sub sg/ approx. = 3.0K. A quasielastic neutron scattering study on an single crystal sample was reported with this composition. The antiferromagnetic Bragg peak persists down to 1.2K, well below T/sub sg/, and the diffuse scattering becomes temperature independent below about 6.0K, with the correlation length frozen at about 2.3 lattice spacings. No results suggests that there is coexistence between long range antiferromagnetic order and short-range spin-glass order for the longitudinal spin-component. Such a behavior is consistent with the predictions of the vector mean-field theory (infinite range model) for spin-glasses with strong unaxial anisotropy. DOE

N85-22198# Brookhaven National Lab., Upton, N. Y.
PARAMAGNETIC SCATTERING FROM NI
P. Boeni and G. Shirane Oct. 1984 22 p refs Presented at 30th Ann. Conf. on Magnetism and Magnetic Materials, San Diego, Calif., 27 Nov. 1984
(Contract DE-AC02-76CH-00016)
(DE85-004207; BNL-35482; CONF-841184-22) Avail: NTIS HC A02/MF A01

New polarized beam measurements were carried out in the paramagnetic phase of (60)Ni in order to enlarge the (q,(LC OMEGA)) range previously studied by Steinsvoll, et al. Magnetic scattering was detected up to halfway to the zone boundary. The results can be successfully interpreted in terms of a diffusive type scattering function over an unexpected wide (g,OMEGA) range g < 80 MeV. The neutron data are also compared with the predictions of the very recent band model by Callaway. Finally, important similarities and differences are pointed out in the paramagnetic scattering from localized systems, such as EuO, and itinerant systems and discuss the universality of the paramagnetic scattering function. DOE

N85-22199# Cornell Univ., Ithaca, N.Y.
SUMMARY OF RECENT RESEARCH ON MECHANICAL BEHAVIOR OF POLYCRYSTALLINE SOLIDS Progress Report, Mar. 1984 - Mar. 1985
C.-Y. Li Nov. 1984 167 p refs
(Contract DE-FG02-84ER-45055)
(DE85-004601; DOE/ER-45055/6) Avail: NTIS HC A08/MF A01

Topics covered include: (1) a state variable approach to the analysis of transient creep deformation in stress reduction experiments; (2) the strainaging behavior of 316 stainless steel at room temperature; (3) machine design, instrumentation and data analysis techniques for conventional mechanical testing at elevated strain rates; (4) grain boundary sliding behavior and related deformation phenomena in Incoloy 800H at elevated temperatures; and (5) a progress in analytical and numerical research on the finite element modeling of non-elastic deformation processes using state variable constitutive laws. In general, a state variable approach was taken in developing a description of the deformation phenomena studies. DOE

N85-22200# Sandia Labs., Albuquerque, N. Mex.
EVALUATION OF IMPLANTATION-DISORDERING OF (InGa)As/GaAs STRAINED-LAYER SUPERLATTICES
D. R. Myers, C. E. Barnes, G. W. Arnold, L. R. Dawson, R. M. Biefeld, T. E. Zipperian, P. L. Gourley, and I. J. Fritz 1984 8 p refs Presented at the Symp. on the Scientific Basis for Nucl. Waste Management, Boston, 26 Nov. 1984
(Contract DE-AC04-76Dp-00789)
(DE85-003533; SAND-84-1293C; CONF-841157-24) Avail: NTIS HC A02/MF A01

The optical and transport properties of InO 2GaO 8As/GaAs strained-layer superlattices (SLS's) which were implanted either with 5 x 10 to the 15th power, 250 keV Zn(+) or with 5 x 10 to 14th power/square cm/cm(2), 70 keV Be(+) and annealed under an arsenic overpressure at 600 (0) C were examined. For both cases, electrical activation in the implantation-doped regions equalled that of similar implants and anneals in bulk GaAs, even though the Be implant retained the SLS structure, while the Zn implant intermixed the SLS layers to produce an alloy semiconductor of the average SLS composition. Photoluminescence intensities in the annealed implanted regions were significantly reduced from that of virgin material, apparently due to residual implant damage. Diodes formed from both the Be- and the Zn-implanted SLS' produced electroluminescence intensity comparable to that of grown-junction SLS diodes in the same chemical system, despite the implantation processing and the potential for vertical lattice mismatch in the Zn-disordered SLS device. These results indicate that Zn-disordering can be as useful for strained-layer superlattices as in lattice-matched systems. DOE

N85-22201# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
STUDY OF ENERGY VERSUS MISORIENTATION FOR GRAIN BOUNDARIES IN GOLD BY CRYSTALLITE ROTATION METHOD. 1: 001 TWIST BOUNDARIES
S. W. Chan and R. W. Balluffi Nov. 1984 23 p refs
(Contract DE-FG02-84ER-45116)
(DE85-004598; DOE/ER-45116/4) Avail: NTIS HC A02/MF A01

Small gold crystallites (approx. 50 to 80 nm dia) were welded to thin film [001] single crystal gold substrates at a series of predetermined [001] twist angles in the range 0 to 45(0). A pure [001] twist boundary therefore existed in each welded neck region which could be observed directly by transmission electron microscopy at normal incidence. Upon annealing, the crystallites rotated around [001] when the boundary energy varied with theta. The crystallites rotated into three misorientations corresponding to the special (SIGMA)1 and (SIGMA)5 misorientations and a symmetry related misorientation at theta=45(0). These results indicate the existence of grain boundary misolocation (GBD) related cusps on the boundary energy versus theta curve at (SIGMA)1 and (SIGMA)5. The rotations occurred conservatively by the motion of screw GEDs which could be observed directly by the transmission microscopy in certain regimes of theta. The results are relevant to recent calculations of the energies of [001] twist boundaries and the applicability of the GBD/structural unit model for grain boundaries. DOE

N85-22202# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany). Abt. fuer Mikrostrukturtechnik.
TECHNOLOGY OF THIN SILICON FOILS FOR THE FABRICATION OF MONOLITHIC INTEGRATED SENSORS Final Report, Dec. 1983
Laszlo Cspregi, Karl Kuehl, Rosemarie Niessl, and Helmut Seidel Bonn Bundesministerium fuer Forschung und Technologie Sep. 1984 123 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-209; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

For the manufacture of mechanical sensors on the base of thin silicon foils, an etching technique and epitaxial layers were developed. The concentration dependence and temperature behavior of anisotropic selective etchants were studied. Stress and defect-free epitaxial layers were fabricated with a boron concentration of 1 times 10 to the 20th power atoms/cucm by simultaneous germanium doping. A model for the geometrical optimization of an acceleration sensor with respect to sensitivity and resonance frequencies was developed. Accelerameters with poly and monocrystalline piezoresistors were manufactured. Their sensitivity, temperature and frequency behavior was studied. An accelerometer with a monolithic integrated test circuit was developed. Author (ESA)

N85-22203# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
TEXTURE INDEPENDENT DETERMINATION OF RESIDUAL STRESS IN POLYCRYSTALLINE AGGREGATES USING RAYLEIGH WAVES
C. M. Sayers Sep. 1984 12 p refs
(AERE-R11483) Avail: Issuing Activity

The Rayleigh wave velocity for a polycrystalline aggregate of cubic crystals with orthorhombic symmetry is derived. The formalism of Rod for treating the texture of polycrystalline aggregates is used. It is shown that surface wave velocity measurements can be combined with the normal shear wave birefringence technique to give a texture independent determination of the difference in principal stresses. The accuracy of the theory is demonstrated for rolled aluminum and steel plates. Author

N85-22239*# Tennessee Technological Univ., Cookeville. Dept. of Electrical Engineering.
ELECTRICAL PERFORMANCE OF SEMICONDUCTOR DEVICES AT CRYOGENIC TEMPERATURES
Carl A. Ventrice *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20L

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-22204*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDEAL GAS THERMODYNAMIC PROPERTIES FOR THE PHENYL, PHENOXY, AND o-BIPHENYL RADICALS
Alexander Burcat, Frank J. Zeleznik, and Bonnie J. McBride Jan. 1985 22 p refs
(NASA-TM-83800; E-2303; NAS 1.15:83800) Avail: NTIS HC A02/MF A01 CSCL 20M

Ideal gas thermodynamic properties of the phenyl and o-biphenyl radicals, their deuterated analogs and the phenoxy radical were calculated to 5000 K using estimated vibrational frequencies and structures. The ideal gas thermodynamic properties of benzene, biphenyl, their deuterated analogs and phenyl were also calculated. Author

N85-22205# Mound Lab., Miamisburg, Ohio.
FAST TIMES AT HIGH TEMPERATURES
M. D. Kelly and L. D. Abney 1984 9 p Presented at the 7th International Society for Optical Engineering Meeting on Thermosense, Cambridge, Mass., 5 Nov. 1984
(Contract DE-AC04-76DP-00053)
(DE85-003306; MLM-3214(OP); CONF-8411120-1) Avail: NTIS HC A02/MF A01

High temperatures generated during rapid thermal reactions require techniques to index time and calibrate high temperature. The technique used to establish time required the design and fabrication of a time indexing constant temperature source to measure reaction times. A unique black body source was used for high temperature calibration. These techniques and their applications will be discussed. DOE

N85-22206# Argonne National Lab., Ill. Materials Science and Technology Div.
GREEN'S FUNCTION SOLUTION OF THE KONDO PROBLEMS AND UNIVERSALITY OF THE THERMODYNAMIC PROPERTIES
Tadashi Arai Sep. 1984 25 p refs Presented at the 30th Ann. Magnetism and Magnetic Mater. Conf., San Diego, Calif., 27-

30 Nov. 1984
(Contract W-31-109-eng-38)
(DE85-002739; CONF-841184-4) Avail: NTIS HC A02/MF A01

Using a functional derivative approach, a Green's function solution is derived for the nondegenerate Anderson model of dilute magnetic alloys, which is valid at all temperatures and which accurately exhibits the Kondo effect. This is made possible by explicitly satisying the Baym criterion for the macroscopic conservation of particle-number, momentum and energy - a criterion not satisfied by any of the earlier Green's function treatment of the Kondo model or the Anderson model. The free energy of the system is calculated and the university of all the thermodynamic properties and the resistivity is analytically demonstrated. The temperature-dependent susceptibility chi(T), specific heat C(T) and resistivity R(T) are calculated and it is found that the universal curves for chi(T) and C(T) are almost indistinguishable from the results of the renormalization group theory. Author

N85-22207# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics and Astronomy.
RESEARCH IN THEORETICAL PHYSICS Annual Progress Report, 1 Apr. 1983 - 31 Mar. 1984
G. Domokos and S. Koevesi-Domokos Nov. 1984 17 p refs
(Contract DE-AC02-76ER-03285)
(DE85-004286; DOE/ER-03285/47) Avail: NTIS HC A02/MF A01

A dynamical model of the family structure of quarks and leptons was investigated in the context of a spontaneously broken local family symmetry. General results were obtained concerning the structure of gauge theories with a dynamically broken symmetry. Measurement of magnetic moments of heavy quarks and leptons is proposed in order to discover their conjectured substructure. DOE

N85-22208# National Bureau of Standards, Gaithersburg, Md. Center for Chemical Physics.
COMPILED AND THERMODYNAMIC DATA SOURCES FOR AQUEOUS AND BIOCHEMICAL SYSTEMS: AN ANNOTATED BIBLIOGRAPHY, 1930 - 1983 Final Report
R. N. Goldberg Dec. 1984 110 p Sponsored by American Inst. of Chemical Engineers
(PB85-137693; NBS/SP-685; LC-84-601131) Avail: NTIS HC A06/MF A01; SOD HC as SN003-003-02606-9 CSCL 07D

A selected and annotated bibliography of sources of compiled and evaluated chemical thermodynamic data relevant to biochemical and aqueous systems is presented. The principal thermodynamic properties considered herein are Gibbs energy and equilibrium data, enthalpies of formation and reaction, heat capacities and entropies, and the corresponding partial molar and excess properties. Derived quantities used in calculating the above are also included. Transport and mechanical data are also identified to a lesser degree. Included in the annotations to the data sources are brief descriptions of the types of properties tabulated, the classes of materials dealt with, and the degree of completeness of the compilations. Approximately 162 works are cited. Author (GRA)

N85-22303# Clermont-Ferrand Univ. (France). Dept. de Mathematiques.
CONSERVED QUANTITIES AND RADIATIVE ASPECTS OF ASYMPTOTICALLY ANTI-DE SITTER SPACE-TIMES
A. Magnon *In* ESA Plasma Astrophys. Nov. 1984 p 237-238 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-22209*# National Aeronautics and Space Administration, Washington, D. C.
AN OPEN-ENDED FUTURE: IN DEFENSE OF A NEW HUMANISM
Jesco vonPuttkamer Dec. 1984 20 p refs Transl. into ENGLISH of "Zukunft mit Offenen Grenzen? Plaedoyer fuer einen Neuen Humanismus" NASA, Washington, D.C., Sep. 1984 p 1-19 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77613; NAS 1.15:77613) Avail: NTIS HC A02/MF A01 CSCL 05K

The edge between technology and humanism is discussed. Advances in biology, in medicine, energy technology, tools and weapons, communications, psychology, problem solving and information storage, transportation, and other fields are presented. Ecology in self-transcendence and space travel as a survival tool are considered. Author

N85-22210*# Alabama Univ., Tuscaloosa.
RESEARCH REPORTS: 1984 NASA/ASEE SUMMER FACULTY FELLOWSHIP PROGRAM
L. Michael Freeman, ed., T. Leroy Osborn, ed. (NASA. Marshall Space Flight Center), James B. Dozier, ed. (NASA. Marshall Space Flight Center), and Gerald R. Karr, ed. (Alabama Univ., Huntsville) Jan. 1985 776 p refs Program held 29 May - 3 Aug. 1984
(Grant NGT-01-002-099)
(NASA-CR-171317; NAS 1.26:171317) Avail: NTIS HC A99/MF E03 CSCL 05I

A NASA/ASEE Summer Faculty Fellowship Program was conducted at the Marshall Space Flight Center (MSFC). The basic objectives of the programs are: (1) to further the professional knowledge of qualified engineering and science faculty members; (2) to stimulate an exchange of ideas between participants and NASA; (3) to enrich and refresh the research and teaching activities of the participants' institutions; and (4) to contribute to the research objectives of the NASA Centers. The Faculty Fellows spent ten weeks at MSFC engaged in a research project compatible with their interests and background and worked in collaboration with a NASA/MSFC colleague. This document is a compilation of Fellows' reports on their research during the summer of 1984. Topics covered include: (1) data base management; (2) computational fluid dynamics; (3) space debris; (4) X-ray gratings; (5) atomic oxygen exposure; (6) protective coatings for SSME; (7) cryogenics; (8) thermal analysis measurements; (9) solar wind modelling; and (10) binary systems. For individual titles, see N85-22211 through N85-22242.

N85-22211*# Furman Univ., Greenville, S.C. Dept. of Computer Science.
USING A DATA BASE MANAGEMENT SYSTEM FOR MODELLING SSME TEST HISTORY DATA c82
Kenneth Abernethy *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05B

The usefulness of a data base management system (DBMS) for modelling historical test data for the complete series of static test firings for the Space Shuttle Main Engine (SSME) was assessed. From an analysis of user data base query requirements, it became clear that a relational DMBS which included a relationally complete query language would permit a model satisfying the query requirements. Representative models and sample queries are discussed. A list of environment-particular evaluation criteria for the desired DBMS was constructed; these criteria include requirements in the areas of user-interface complexity, program independence, flexibility, modifiability, and output capability. The evaluation process included the construction of several prototype data bases for user assessement. The systems studied, representing the three major DBMS conceptual models, were: MIRADS, a hierarchical system; DMS-1100, a CODASYL-based network system; ORACLE, a relational system; and DATATRIEVE, a relational-type system. B.W.

N85-22212*# Alabama A & M Univ., Normal. Dept. of Chemistry.

SRM FILAMENT WOUND CASE RESIN CHARACTERIZATION STUDIES c27

Libby W. Chou *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 19 p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11G

The amine cured epoxy wet winding resin used in fabrication of the SRM filament wound case is analyzed. High pressure liquid chromatography (HPSC) is utilized extensively to study lot-to-lot variation in both resin and curing agent. The validity of quantitative hplc methodology currently under development in-process resin/catalyst assay is assessed. B.W.

N85-22213*# Georgia Inst. of Tech., Atlanta. School of Mathematics.

INVESTIGATION OF THE EFFECTS OF NaOH DOPANT LEVEL ON THE PHYSICAL AND MECHANICAL PROPERTIES OF CARBON/PHENOLIC COMPOSITE MATERIAL c24

Raymond G. Clinton, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 35 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11D

The near-catastrophic erosion of the STS-8A solid rocket booster nozzle was the instigating factor in the recent, and on-going, intensive investigation of carbon/phenolic composite materials. Much of this effort has been focused on the effect of sodium contamination on the carbon fibers. It is known that sodium acts as a catalyst in the oxidation of the fibers at elevated temperatures. A study was undertaken to determine what changes were caused by variation in sodium content. Investigations were conducted in three areas: (1) phenolic resin; (2) carbon/phenolic prepreg; and (3) cured laminates. Due to the exploratory nature of the studies, a variety of tests in addition to those normally run in production facilities were considered. The experimental methodologies and results of these experiments are discussed, and recommendations for improving techniques and extending the research program are presented. B.W.

N85-22214*# Tennessee Technological Univ., Cookeville. Dept. of Chemistry.

SILICON CARBIDE-SILICON NITRIDE FIBERS: PREPARATION AND CHARACTERIZATION OF POLYCARBOSILAZANE PRECURSORS c24

David J. Crouse *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11D

This study examines the effect of modifications of the chemical structure of the monomers on the properties of the polymeric precursor and and ceramic fibers. A group of silaneamines, R'-Si (NH-R) sub 3, taken from the series where R' is methyl or phenyl and R is n-propyl, n-butyl, phenyl or allyl, are converted to polycarbosilazanes by heating in excess of 500 C. Resins obtained from this polymerization are characterized by NMR and IR spectroscopy and GPC. Each resin is tested for fiber-forming properties. Resin samples and fibers are hydrolytically cured. Thermogravimetric analyses are conducted on the cured resins to compare the relative thermal stability and examine the pyrolysis process. Cured fibers are tested for tensil strength. Author

N85-22215*# Oregon Univ., Eugene. Inst. of Theoretical Science.

STUDY OF THE POTENTIAL USEFULNESS OF SUPERFINE HOLOGRAPHIC X-RAY GRATINGS IN AXAF AND ASTROPHYSICS IN GENERAL c35

Paul L. Csonka *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 25 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14E

Present day high energy electron storage rings and insertion devices (wigglers and undulators) provide the necessary technology to manufacture superfile (line density > or = 100,00/mm) holographic X-ray gratings. The usefulness in future astrophysical research of such gratings is determined, as a function of the grating size and line density. A model design is given for an instrument which would fit within the (presently specified) constraints of the planned Advanced X-ray Astrophysics Facility (AXAF). B.W.

N85-22216*# Calhoun Community Coll., Decatur, Ala. Dept. of Natural Sciences.

INVESTIGATION OF FOAM FLOTATION AND PHASE PARTITIONING TECHNIQUES c27

Ben L. Currin *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 15 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11G

The present status of foam flotation as a separation process is evaluated and limitations for cells and proteins are determined. Possible applications of foam flotation to separations in microgravity are discussed. Application of the fluid mechanical aspects of foam separation techniques is made to phase partitioning in order to investigate the viscous drag forces that may effect the partitioning of cells in a two phase poly(ethylene glycol) and dextran system. Author

N85-22217*# North Georgia Coll., Dahlonega. Dept. of Physics.

MODELS OF THE UPPER ATMOSPHERE c46

T. Michael Davis *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 28 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 04A

Several computer models of the thermosphere are discussed. J70MM, the Jacchia 1970 model with matrix and matrix mean output, and J703X, the Jacchia 1970, 1971, and 1977 models, are of primary interest. The subroutines in these programs were studied in detail, and several mistakes were found and corrected. It is proposed that a weighted average of the three-hour geomagnetic index be used in the models rather than a single index value. The densities (for a given date and time) generated by the J703X program (all three models), using both a single value of the index and weighted averages for three different lag times, are tabulated and discussed. Most of the equations used in the models are the results of empirical curve fits. An attempt was made to generate a theoretical prediction of the thermospheric temperature profile based on a simple physical model of atmospheric heat conduction in a spherically-symmetric shell. The exponential heating theory and the temperature dependence of k are discussed. B.W.

N85-22218*# Auburn Univ., Ala. Dept. of Computer Science.

SINGULAR ASYMPTOTIC EXPANSIONS IN NONLINEAR ROTORDYNAMICS c37

William B. Day *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24 p refs Previously announced as N85-10100 (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 13K

During hot firing ground testing of the Space Shuttle's Main Engine, vibrations of the liquid oxygen pump occur at frequencies which cannot be explained by the linear Jeffcott model of the rotor. The model becomes nonlinear after accounting for deadband, side forces, and rubbing. Two phenomena present in the numerical solutions of the differential equations are unexpected periodic orbits of the rotor and tracking of the nonlinear frequency. A multiple scale asymptotic expansion of the differential equations is used to give an analytic explanation of these characteristics. M.A.C. (IAA)

N85-22219*# John Brown Univ., Siloam Springs, Ark. Dept. of Mechanical Engineering.

A STUDY OF THE COMPATIBILITY OF AN EXISTING CFD PACKAGE WITH A BROADER CLASS OF MATERIAL CONSTITUTIONS c34

Kenneth W. French, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program

(NASA-CR-171317) Jan. 1985 21 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20D

The flexibility of the PHOENICS computational fluid dynamics package was assessed along two general avenues; parallel modeling and analog modeling. In parallel modeling the dependent and independent variables retain their identity within some scaling factors, even though the boundary conditions and especially the constitutive relations do not correspond to any realistic fluid dynamic situation. PHOENICS was used to generate a CFD model that should exhibit the physical anomalies of a granular medium and permit reasonable similarity with boundary conditions typical to membrane or porous piston loading. A considerable portion of the study was spent prying into the existing code with a prejudice toward rate type and disarming any inherent fluid behavior. The final stages of the study were directed at the more specific problem of multiaxis loading of cylindrical geometry with a concern for the appearance of bulging, cross slab shear failure modes. B.W.

N85-22220*# Auburn Univ., Ala. Dept. of Physics.
CHARACTERIZATION OF MATERIAL SURFACES EXPOSED TO ATOMIC OXYGEN ON SPACE SHUTTLE MISSIONS c25
Albert T. Fromhold *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 12p ref (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

Material samples prepared for exposure to ambient atomic oxygen encountered during Space Shuttle flights in low Earth orbit were characterized by the experimental techniques of ELLIPSOMETRY, ESCA, PIXE, and RBS. The first group of samples, which were exposed during the STS-8 mission, exhibited some very interesting results. The second group of samples, which are to be exposed during the upcoming STS-17 mission, have been especially prepared to yield quantitative information on the optical changes, oxygen solution, and surface layer formation on metal films of silver, gold, nickel, chromium, aluminum, platinum, and palladium evaporated onto optically polished silicon wafers. Author

N85-22221*# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.
AN INVESTIGATION OF SPACE SHUTTLE MAIN ENGINE SHUTDOWN CHUGGING INSTABILITY c20
Paul E. George, II *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 36p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 21H

The Space Shuttle Main Engines experience a low frequency pressure pulsation in both the fuel and oxidizer preburners during shutdown. The pressure pulsations (chugging) occur during the helium purge of oxidizer from the preburner manifolds. Possible causes and triggering mechanisms are considered as details of the chugging process are presented and discussed. A simple chugging model capable of predicting pressure excursion amplitudes and frequencies is proposed and preliminary results presented. Author

N85-22222*# Mississippi State Univ., State College. Dept. of Chemical Engineering.
RELIABILITY OF STRUCTURAL BRITTLE MATERIALS c39
William B. Hall *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 18p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20K

Traditionally, the use of brittle materials has been avoided in demanding structural applications because of their unreliability. They have been used however, due to other desirable properties, in nonstructural applications or where the mechanical load is minimal. The most common method utilized today for the design approach of brittle materials is the probabilistic, which takes into consideration the flaw and stress distribution within the brittle material. It does not take into consideration the fracture mechanics effect of strength degradation while aging under a mechanical load. This project will combine the two methods, probabilistic and fracture mechanics, into a more reliable design method for brittle materials. G.L.C.

N85-22223*# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical Engineering.
HYDRODYNAMIC STABILITY PROBLEM FORMULATED BY NUMERICAL SOLUTIONS OF THE NAVIER-STOKES EQUATIONS c34
J. M. Hyun *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 10p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20D

The problem of hydrodynamic stability and the transition from laminar to turbulent flows are reformulated by seeking numerical solutions of the full, unapproximated Navier-Stokes equations. This method differs significantly from the well known Orr-Sommerfeld equation approach. The oncoming laminar flow is disturbed by forced, time dependent perturbations. The magnitudes of these perturbations are arbitrary. Then, the ensuing spatial and temporal development of the imposed perturbations on the basic flow is calculated by direct numerical solutions of the time dependent Navier-Stokes equations. One of the main advantages of this method is its ability to simulate nonlinear processes. As a specific application of this technique to SSME (Space Shuttle Main Engine) flow configurations, computer programs have been written for the two dimensional flow over a backward facing step. This numerical code will be tested for operational use as part of a continued research collaboration effort with the NASA/MSFC counterparts. G.L.C.

N85-22224*# Auburn Univ., Ala. Dept. of Mechanical Engineering and Materials Engineering.
THE STRENGTH AND CHARACTERISTICS OF VPPA WELDED 2219-T87 ALUMINUM ALLOY c26
Wartan A. Jemian *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 35p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11F

A study of the variable polarity plasma arc (VPPA) welding process and those factors that control the structure and properties of VPPA welded aluminum alloy 2219-T87 was conducted. The importance of joint preparation, alignment of parts and welding process variables are already established. Internal weld defects have been eliminated. However, a variation of properties was found to be due to the size variation of interdendritic particles in the fusion zone. These particles contribute to the void formation process, which controls the ultimate tensile strength of the welded alloy. A variation of 150 microns in particle size correlated with a 10 ksi variation of ultimate tensile strength. It was found that all fracture surfaces were of the dimple rupture type, with fracture initiating within the fusion zone. G.L.C.

N85-22225*# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
NON-CONTACTING ELECTROMAGNETIC DE-SPIN SYSTEM FOR EARTH ORBITING SATELLITES c15
Prasad K. Kadaba *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 27p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22B

A study of electromagnetic satellite de-spin system for orbiting satellites was conducted. Exact closed form solutions for the interacting magnetic flux have been formulated both for the case of the current loop and the bar magnet. The magnet system has been extended to the case of a U shaped magnet. Magnet design details are outlined. Computer simulation of the interacting flux density profile has been attempted. Data for the de-spin times has been extended to higher rpms. G.L.C.

N85-22226*# South Dakota State Univ., Brookings. Dept. of Physics.
CONSIDERATIONS FOR UPGRADING MODIFICATIONS TO THE

MARSHALL SPACE FLIGHT CENTER'S X-RAY CALIBRATION FACILITY c14

J. H. Kitterman *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14B

The Marshall Space Flight Center's X-ray Calibration Facility was constructed for preflight calibration of the HEAO-B X-ray Telescope (1978-1981). Calibration requirements for a newly proposed X-ray telescope, AXAF (scheduled for flight early 1990's), go beyond the capabilities of the facility at present. Several of these new requirements are discussed, among them: (1) the production of a pure unpolarized X-ray beam, (2) minimizing the target/tube change over time, and (3) how to configure the X-ray source chamber to effectively accommodate both polarized and unpolarized X-ray sources. G.L.C.

N85-22227*# Oregon Univ., Eugene. Dept. of Chemistry.
ANALYSES VIA AUTOMATED MASS SPECTROMETRY (MS/DS) c25

T. Koenig *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 22p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

New or improved uses of the Finnigan 4000 quadrupole mass spectrometer (MS) with its associated INCOS data system (DS) were investigated. The first phase involved an evaluative activity in which specific problems with miscalibration and gas chromatographic column conditioning were identified. This also revealed one solution to the problem of detection of substances not visible in the gas chromatography detection mode. A second phase was to seek useful applications of the direct inlet systems. This mode of sample introduction has not been previously utilized on the existing equipment and was successfully applied to the analysis of the components of TONOX 60/40 and in the thermal degradation products of some polymeric materials. Suggestions are made for improving and expanding the use of the MS/DS system in materials development and testing. G.L.C.

N85-22228*# Middle Tennessee State Univ., Murfreesboro. Dept. of Chemistry and Physics.
GERMANIUM RESISTANCE THERMOMETER CALIBRATION AT SUPERFLUID HELIUM TEMPERATURES c35

Franklin Curtis Mason *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 14B

The rapid increase in resistance of high purity semi-conducting germanium with decreasing temperature in the superfluid helium range of temperatures makes this material highly adaptable as a very sensitive thermometer. Also, a germanium thermometer exhibits a highly reproducible resistance versus temperature characteristic curve upon cycling between liquid helium temperatures and room temperature. These two factors combine to make germanium thermometers ideally suited for measuring temperatures in many cryogenic studies at superfluid helium temperatures. One disadvantage, however, is the relatively high cost of calibrated germanium thermometers. In space helium cryogenic systems, many such thermometers are often required, leading to a high cost for calibrated thermometers. The construction of a thermometer calibration cryostat and probe which will allow for calibrating six germanium thermometers at one time, thus effecting substantial savings in the purchase of thermometers is considered. G.L.C.

N85-22229*# Alabama Univ., Birmingham. Dept. of Computer and Information Science.
EVALUATION OF EXPERT SYSTEMS c63

Michael A. McAnulty *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 20p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 09B

The only successful applied area of artificial intelligence is that of expert systems, programs which collect and arrange information about the solution of difficult problems in a well-defined and well-circumscribed area, and are then capable of mimicking expert behavior in finding solutions to new problems. NASA intends to investigate the application of this technology to management and control situations in a space station environment, specifically for power, heat, communications, and attitude control, areas where much of the time human management is laborious, repetitive, and eventually error-prone. G.L.C.

N85-22230*# Berry Coll., Mount Berry, Ga. Dept. of Physics.
EVALUATION OF OMV RANGING AND DOCKING SYSTEMS c17

Malcolm W. McDonald *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 18p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22A

The Orbital Maneuvering Vehicle (OMV) will serve as a shuttle-based or permanent space station-based vehicle designed to rendezvous and soft dock with various other free-flying space vehicles for purposes of inspection, support, and retrieval. This study is concerned primarily with the eventual need for the OMV to rendezvous and dock softly with the Edwin P. Hubble Space Telescope (ST). Utilizing the available capabilities of the large microwave anechoic chamber facility at Marshall Space Flight Center for simulating docking target vehicle motions in a free-space environment, a program is being devised for benchmark testing of rendezvous and docking sensor systems proposed for use on the OMV. A testing regimen suitable for evaluating the accuracy and tracking agility in sensing range, range rate, and angle information at close ranges ($0 < R < 30$m) has been developed. G.L.C.

N85-22231*# San Juan Coll., Farmington, N. Mex.
THE MODELLING OF LATITUDINAL GRADIENTS IN THE SOLAR WIND IN THE OUTER SOLAR SYSTEM c92

Steven Nerney *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 22p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 03B

A steady, axisymmetric, quasi-radial, global model is developed for thermally driven stellar winds with embedded magnetic fields. The asymptotic, linear results are presented for 0(1) latitudinal variations in the radial magnetic field, mass-loss rate, and radial velocity of the wind. The MHD equations are solved for the latitudinal dependence of the rotational velocity and magnetic field. They are driven by the meridional flows that develop naturally from internal magnetic stresses. Most flows open flux tubes in the stars equatorial plane, redistributing mass and magnetic flux as a function of stellar latitude. The plasma spins up to conserve angular momentum in fields and plasma. Author

N85-22232*# Alabama Univ., Tuscaloosa. Dept. of Mathematics.
A MATHEMATICAL FORMULATION OF THE PROBLEM OF OPTIMAL USE OF GROUND RESOURCES FOR FUTURE SPACE MISSIONS c81

Meckinley Scott *In its* Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05A

An approximate mathematical formulation for scheduling of future space missions is proposed. The objective is to schedule the flights to efficiently use the available ground resources, to minimize the inventory level of ground resources needed and to minimize the overlapping or conflicting periods during which the same types of resources are used by the various flights. The development of the mathematical formulation of the problem considers the presence of a large number of sequencing and resource constraints: (1) the order in which the flights are to be launched is predetermined; and (2) some types of resources are to be used only by certain flights. A linear objective function based

on cost considerations is constructed and this function is minimized subject to the various constraints. E.A.K.

N85-22233*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
SENSOR CONTROL OF ROBOT ARC WELDING c37
Fred R. Sias, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 91p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 13H

A basic problem in the application of robots for welding which is how to guide a torch along a weld seam using sensory information was studied. Improvement of the quality and consistency of certain Gas Tungsten Arc welds on the Space Shuttle Main Engine (SSME) that are too complex geometrically for conventional automation and therefore are done by hand was examined. The particular problems associated with Space Shuttle Main Engine (SSME) manufacturing and weld-seam tracking with an emphasis on computer vision methods were analyzed. Special interface software for the MINC computr are developed which will allow it to be used both as a test system to check out the robot interface software and later as a development tool for further investigation of sensory systems to be incorporated in welding procedures. E.A.K.

N85-22234*# Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
DEBRIS IMPACT ON EARTH-ORBITING SPACECRAFT c12
Dallas G. Smith *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 15p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 22A

The accumulation of Earth-orbiting space debris leads to important new design considerations. Some 5,000 orbiting objects, many of them explosion fragments, are currently being tracked and future collision of these objects with each other is predicted. These collisions will occur at high velocities. Each collision will be explosive, ejecting thousands, of new orbiting objects, in turn increasing the frequency of future collisions. The debris population may thus become self-regenerative, and the future flux of orbiting debris will exceed that of meteoroids. As a result, a large space structure in Earth-orbit for several years has a significant probability of impact by debris objects. As a design problem, debris impact is significantly different from meteoroid impact. Protection against such large objects may require structural measures. The consideration of debris impact in the design of large, Earth-orbiting spacecraft is recommended. E.A.K.

N85-22235*# Alabama Univ., Huntsville. Dept. of Mechanical Engineering.
EXPERIMENTAL DETERMINATION OF SYSTEMS SUITABLE FOR STUDY AS MONOTECTIC BINARY METALLIC ALLOY SOLIDIFICATION MODELS c26
James E. Smith, Jr. *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 11F

Transparent binary metallic alloy solidification models are important in attempts to understand the processes causing liquid-liquid and solid-liquid phase transformations in metallic alloy systems. These models permit visual observation of the phase transformation and the processes proceding solidification. The number of these transparent monotectic binary models needs to be expanded to distinguish between the unique and general phenomena observed. The expansion of the number of accurately determined monotectic phase diagrams of model systems, and contribution to a data base for eventual use with UNIFAC group contribution methods is examined. E.A.K.

N85-22236*# Alabama Univ., Huntsville. Dept. of Electrical and Computer Engineering.
NEW RESULTS ON THE PLL FALSE LOCK PHENOMENON c27
John L. Stensby *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 26p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 12A

Conditions, based on the multipliers of a linear differential equation with periodic coefficients, for the occurrence of false lock in a phase lock loop (PLL) are presented. Two new and powerful algorithms are presented for computing the frequency difference between the reference and voltage controlled oscillator when the loop is false locked. The first algorithm expresses omega f sup -1 as a power series in the closed loop gain. The second algorithm expresses omega sup -1 as part of a solution to a nonlinear algebraic system of equations which can be solved by numerical methods. The power of both algorithms is illustrated by application and comparison. E.A.K.

N85-22237*# Alabama A & M Univ., Normal. Dept. of Chemistry.
A COMPUTER CONTROLLED MASS SPECTROMETER SYSTEM FOR INVESTIGATING THE DECOMPOSITION OF NON-METALLIC MATERIALS UNDER ATMOSPHERIC CONDITIONS c25
James M. Thompson *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 23p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 07D

A PDP 11/23 quadrupole mass spectrometer system was coupled to a nondiscriminating gas inlet system permitting gases at atmospheric pressure to be admitted into a high vacuum chamber containing the ion source of the mass spectrometer without separation of the gaseous components. The resolution of related software problems has resulted in a convenient computer-mass spectrometer system capable of generating masses, relative intensities and related data on the gaseous products resulting from the atmospheric thermal decomposition of nonmetallic materials. E.A.K.

N85-22238*# Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
SOLID ROCKET MOTOR CASE (SRMC) DYNAMIC SENSITIVITY TO CHANGES IN COMPOSITE PROPERTIES c20
R. Noel Tolbert *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 20p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 21H

Traditional composite lamination theory was used to compute the constitutive matrices using a potential range of lamina properties. Sensitivity of vibrational frequencies was examined for variations in constituent materials and geometric properties. The material component interactions examined were the lamina longitudinal and transverse Young's modulus, the lamina Poisson's ratio, and the shear modulus. Fiber and resin properties were related to the frequency response through lamina properties. Geometric properties examined are void ratio and helical wind angle. Capabilities and applications of the SPAR and NASTRAN computer codes are examined for laminated cylindrical shells. E.A.K.

N85-22239*# Tennessee Technological Univ., Cookeville. Dept. of Electrical Engineering.
ELECTRICAL PERFORMANCE OF SEMICONDUCTOR DEVICES AT CRYOGENIC TEMPERATURES c76
Carl A. Ventrice *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20L

The electrical performance of semiconductor devices is examined over the temperature range from 300 to 1.4K The design, fabrication, and testing of p-channel field effective transistors (MOSFET) are emphasized to develop a device that will perform satisfactorily in the temperature range from 4.2 to 1.4K. The current-voltage characteristics of the device are obtained as a

function of temperature for varying channel lengths and channel dopant levels. The MOSFET's with average channel lengths of 3.27, 5.68, 8.37, and 11.39 microns are examined. It is indicated that the devices with the shorter channel lengths perform better in the 4 to 20K range than those with the longer channel lengths. E.A.K.

N85-22240*# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
EVALUATION OF PHOENICS AS A DESIGN ANALYSIS TOOL FOR SSME c61
M. B. Ventrice *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 28p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 09B

The use of the computational fluid dynamics computer code PHOENICS was proposed as a design analysis tool for improving the Space Shuttle Main Engines (SSME). The PHOENICS is a general purpose computer code for the simulation of fluid-flow, heat-transfer and combustion processes arising in engineering, scientific research and environment. It analyzes one or two-phase flows, in one, two, or three dimensions. The application of PHOENICS to evaluate the performance of high-pressure gaseous-hydrogen filters is examined. The usefulness of the code and the ability of the code to handle successively more complex features of the device are demonstrated. E.A.K.

N85-22241*# Alabama A & M Univ., Normal. Dept. of Physics.
THEORETICAL INTERPRETATION OF THERMAL ARREST DATA FROM DIFFERENTIAL THERMAL ANALYSIS MEASUREMENTS c34
Jai-Ching Wang *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 13p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 20M

A theory was developed to interpret the thermal arrest data of HgCdTe system from differential thermal analysis measurements. A nonlinear regression program is used to model fit the data. The purpose is to obtain a set of parameters which will give the information about average radiation coefficient, latent heat of fussion, and specific heat of the HgCdTe system at various compositions. The liquidus and solidus at various compositions are also obtained. The heat radiation from the furnace, heat radiation from the system, heat capacity from both the system and the quartz tube and the heat of fusion of the system are considered, however, it neglects heat transfer through conduction and convection. E.A.K.

N85-22242*# Lambuth Coll., Jackson, Tenn. Dept. of Mathematics and Computer Science.
THE INTELLIGENT DATABASE MACHINE c82
Kenneth E. Yancey *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 21p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05B

The IDM data base was compared with the data base crack to determine whether IDM 500 would better serve the needs of the MSFC data base management system than Oracle. The two were compared and the performance of the IDM was studied. Implementations that work best on which database are implicated. The choice is left to the database administrator. E.A.K.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-22243# Committee on Science and Technology (U. S. House).
OVERSIGHT REVIEW OF THE FIVE-YEAR OUTLOOK REPORT ON SCIENCE AND TECHNOLOGY
Washington GPO 1985 306 p refs Hearing before the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 129, 24 Jan. 1984
(GPO-41-058) Avail: Committee on Science and Technology

A five year outlook report on science and technology is reviewed. Topics discussed include: new directions in science and technology, computers, communication systems, demography, mathematics, education, research systems, industrial research, application of basic biological research to clinical medicine, genetic program of complex organisms, molecular and genetic technology of plans, cell receptors for hormones and neurotransmitters, psychobiology, surface science and its applications, turbulence in fluids, lasers, and the next generation of robots. E.A.K.

N85-22244# Committee on Science and Technology (U. S. House).
1984 SCIENCE AND TECHNOLOGY POSTURE HEARING WITH THE DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY
Washington GPO 1985 65 p Hearing before the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 134, 1 Feb. 1984
(GPO-41-060) Avail: Committee on Science and Technology

The U.S. Government Science and Technology Policy is reviewed. Topics discussed include: research and development, technology utilization, development of high quality technical talent, pursuit of excellence in research, and expansion and strengthening of partnership between government industry, and academia. E.A.K.

N85-22245# Committee on Science and Technology (U. S. House).
AN AGENDA FOR A STUDY OF GOVERNMENT SCIENCE POLICY
Washington GPO 1985 67 p Rept. presented by the Task Force on Sci. Policy to the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., Dec. 1984
(GPO-40-860) Avail: Committee on Science and Technology

The proposed agenda was developed in response to the charge to focus on the issues of maintaining America's leadership in science in view of the changing environment facing us over the coming decades. In developing the proposed agenda, the importance which science has come to play in our national life and in our international relations was considered. At the same time, the two factors which inevitably will affect American science in the future: the growing international strength in science and the urgent need to ensure that science expenditures, as an important component of a federal budget, be provided at optimum levels and be expended in the most effective manner, were considered. As a result, the proposed agenda is broad and raises questions about both the basic purposes of federal funding for scientific research and the specific practices of the governmental agencies for the expenditure of those funds. G.L.C.

N85-22246# Committee on Governmental Affairs (U. S. Senate).
TRANSFER OF TECHNOLOGY
Washington GPO 1984 35 p Presented by the Perm. Subcomm. on Invest. of the Comm. on Govt. Affairs, 98th Congr., 2d Sess., 5 Oct. 1984
(S-Rept-98-664; GPO-51-010) Avail: US Capitol, Senate Document Room

Technology transfer and export control to the Soviet Union were discussed. Topics discussed include: enforcement of the export administration act; organization of Pentagon in export control process; and views from technology exporting community. E.A.K.

N85-22247# Committee on Governmental Affairs (U. S. Senate).
TRANSFER OF TECHNOLOGY
Washington GPO 1984 334 p Hearings before the Permanent Subcomm. on Invest. of the Comm. on Govt. Affairs, 98th Congr., 2d Sess., 2-3; 11-12 Apr. 1984
(S-Hrg-98-986; GPO-37-784) Avail: Permanent Subcommittee on Investigations

Executive branch operations in the drafting, implementing, and enforcing of export controls, particularly concerning the transfer of militarily useful high technology from the West to the Soviet Union and East bloc nations are examined. In particular, the cooperation

between the Commerce Department and the Customs Service in carrying out the enforcement of the Export Administration Act, and the U.S. procedures and policies at Cocom negotiations (Coordinated Committee for Multilateral Export Controls) are discussed. M.G.

N85-22248# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Human Factors.
RESEARCH AND MODELING OF SUPERVISORY CONTROL BEHAVIOR, REPORT OF A WORKSHOP
T. B. Sheridan and R. T. Hennessy 1984 81 p Workshop held in Sarasota, Fla, Feb. 1983
(Contract N00014-81-C-0017)
(AD-A149621) Avail: NTIS HC A05/MF A01 CSCL 05/1

This report of a workshop on Supervisory Control was compiled under the Review of the National Research Council. Supervisory control is the human activity involved in initiating, monitoring, and adjusting processes in systems that are otherwise automatically controlled. The two-day workshop covered three major themes: (1) concepts and characteristics of supervisory control systems; (2) the choice of appropriate research vehicles; and (3) the interchange between researchers and designers. Summary conclusions are: (1) it is useful to characterize the emergency class of human-supervised, computer-controlled systems by strict as well as broader definitions; (2) no single or simple model of supervisory control is appropriate at this time; (3) experimenting with supervisory control systems is difficult for various reasons; (4) experienced subjects are essential for research; (5) supervisory control systems can never be completely closed, since the human supervisor must have the capability to set subgoals; and (6) better guidance from researchers is needed for designers and operators, in the form of principles and checklists. Various articles cover the analysis of supervisory control systems and behavior, mental models, matching mental models of operators and designers and models of human performance. Failure modes are also discussed. GRA

N85-22249# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
A STATISTICAL APPROACH TO VENDOR SELECTION
S. S. Gupta and G. C. McDonald (General Motors Research Lab., Warren, Mich.) Sep. 1984 30 p
(Contracts N00014-75-C-0455; N00014-84-C-0167)
(AD-A149781; TR-83-44) Avail: NTIS HC A03/MF A01 CSCL 12/1

A common problem that arises in practice is the comparison of several Bernoulli processes (or populations) with unknown parameters p sub I, ... p sub k, respectively, where the p sub i's denote the success probabilities. A particular realization of this problem is the critical issue of vendor selection. Deming (1982) notes the importance of vendor selection in a company's efforts to achieve high quality and productivity. In his 14 points, Demin's point 4 suggests the reduction of the number of suppliers to a subset of vendors who can furnish statistical evidence of dependable quality. Vendor selection involves a consideration of many aspects - cost, service, reliability, and quality. Pettit (1984) described the approach that 3M Corporation uses in the evaluation of prospective suppliers. It consists of evaluating potential vendors in four areas: quality, price, performance, and facility capabilities. While quality is explicitly considered in this approach, it is not evaluated in a statistical sense. It is the intent of this article to indicate how statistics can be utilized as one objective evaluation tool in this decision setting. Author (GRA)

N85-22250# Rice Univ., Houston, Tex. Dept. of Psychology.
TASK INFLUENCES IN THE ANALYTIC-INTUITIVE APPROACH TO DECISION MAKING Final Report, 1 Oct. 1981 - 31 Dec. 1984
W. C. Howell Dec. 1984 50 p
(Contract N00014-82-C-0001)
(AD-A149870) Avail: NTIS HC A03/MF A01 CSCL 05/1

The broad purpose of the research conducted under Project NR197-074 was to clarify the effects of certain formally irrelevant task characteristics on judgment and decision performance. The primary integrating theme was Hammond's (1980, 1981) cognitive continuum theory, which classifies a number of general task parameters with respect to their hypothesized influence on human thought. Some conditions, it is suggested, induce a more analytic (rule-based) approach; others, a more intuitive one. Despite measurement problems which prevent a rigorous test of the theory, its logical and taxonomic features have proven useful in organizing the search for, and attack on, task influences. Variables were selected and manipulated in accordance with their expected cognitive implications, even though it is impossible to verify their precise location on the analytic-intuitive continuum. To the extent that judgment or decision behavior changes in the predicted ways, something is learned about these particular task variables, and the basic tenets of the theory are strengthened. While extreme cases -- situations in which people behave relatively normatively (analytic extreme) or heuristically (intuitive extreme) -- are not hard to find and have been well researched as discussed below, this document focus has been on the middle ground, the area where subtle manipulations might have an important effect. Author (GRA)

N85-22251# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
PROBLEMS IN DECENTRALIZED DECISION MAKING AND COMPUTATION Ph.D. Thesis
J. N. Tsitsiklis Dec. 1984 272 p
(Contracts N00014-77-C-0532; N00014-84-K-0519)
(AD-A150025; LIDS-TH-1424) Avail: NTIS HC A12/MF A01 CSCL 05/2

This thesis investigates certain fundamental problems in decentralized decision making and computation. We study the problem of whether a set of decision makers (or processors) with different (but related) information may make compatible decisions without communication and we characterize the computational complexity of this problem. We also analyze the complexity of other basic problems of decentralized decision making, such as decentralized detection (hypothesis testing). We then consider a scheme whereby a set of decision makers (processors) exchange and update tentative decisions which minimize a common cost function, given information they possess; we show that they are guaranteed to converge to consensus. Finally, we consider a broad class of asynchronous distributed (deterministic and stochastic) iterative optimization algorithms tolerating communication delays. We associate communication requirements with such algorithms and show that they converge appropriately under certain conditions which are no more severe than those required for their centralized counterparts. Several applications in human organizations, parallel computation and distributed signal processing are indicated. GRA

N85-22252# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Engineering and Technical Systems.
COMPUTATIONAL MECHANICS: A PERSPECTIVE ON PROBLEMS AND OPPORTUNITIES FOR INCREASING PRODUCTIVITY AND QUALITY OF ENGINEERING Final Report
Oct. 1984 75 p
(Contract N00014-81-C-044)
(PB85-128106) Avail: NTIS HC A04/MF A01 CSCL 05A

Computational mechanics is that discipline of applied science and engineering devoted to the study of physical phenomena by means of computational methods based on mathematical modeling and simulation. Computational mechanics has had a major impact on modern engineering analysis and design. It is the cornerstone of computer-aided engineering and as such, is critical to the nation's industrial future. As in any other aspect of high technology, rapid changes are occurring in computational mechanics. With this in mind, the National Research Council formed a Committee on Computational Mechanics to survey the status of computational mechanics in the United States; to identify important problems that are hindering the use of computational mechanics in improving the productivity and quality of engineering; and to identify solutions to these problems within the framework of engineering reseach in the United States. GRA

N85-22253# President's Private Sector Survey on Cost Control, Washington, D.C.
PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL, REPORT ON RESEARCH AND DEVELOPMENT
1983 173 p
(PB84-173269) Avail: NTIS HC A08/MF A01 CSCL 05A

Results of the Research and Development Task Force of the President's Private Sector Survey on Cost Control in the Federal Government are presented. Recommendations are made which, when fully implemented, could result in significant cost savings. Individual topics addressed include: strategic planning, R and D management and the budget process; privatization; administration of research grants to universities; NASA cost reporting; and research program reporting. M.G.

N85-21418# Joint Publications Research Service, Arlington, Va.
SYSTEMS RESEARCH ON CHINA IN YEAR 2000
Wang Huijiang and Li Boxi *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-008) 27 Mar. 1985 p 37-50 Transl. into ENGLISH from Xitong Gongcheng Lilun Yu Shijian (Beijing), no. 2, 1984 p 15-23 (For primary document see N85-21416 12-31)
Avail: NTIS HC A02/MF A01

N85-22232*# Alabama Univ., Tuscaloosa. Dept. of Mathematics.
A MATHEMATICAL FORMULATION OF THE PROBLEM OF OPTIMAL USE OF GROUND RESOURCES FOR FUTURE SPACE MISSIONS
Meckinley Scott *In its* Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 17p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05A

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-22254# Committee on Science and Technology (U. S. House).
THE AVAILABILITY OF JAPANESE SCIENTIFIC AND TECHNICAL INFORMATION IN THE UNITED STATES
Nancy R. Miller Washington GPO 1984 35 p refs Rept. presented by the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., Nov. 1984 Prepared by Congressional Research Service, Library of Congress
(GPO-39-478) Avail: US Capitol, House Document Room

The growth of high technology products and R&D spending has been accompanied by a significant increase in Japanese scientific and technical information (STI). Experts estimate that in Japan there are currently some 9000 scientific and technical journals. Both the public and private sectors in Japan have been active in coordinating domestic STI and in acquiring foreign scientific and technical literature. For example, in recent years the Japanese government has intensified efforts to establish efficient STI networks to ensure the smooth flow of domestic and foreign data between Japanese researchers. In addition, the overseas offices of Japanese trading companies routinely have monitored scientific and technological developments and collected foreign literature. G.L.C.

N85-22255*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNICAL PUBLICATIONS ANNOUNCED IN 1983
Jun. 1984 345 p
(NASA-TM-83693; E-2151; NAS 1.15:83693) Avail: NTIS HC A16/MF A01 CSCL 05B

This compilation of abstracts describes and indexes over 800 technical publications that resulted from the scientific and engineering work performed and managed by the Lewis Research Center in 1983. Announced in the 1983 issues of STAR (Scientific and Technical Aerospace Reports) and/or IAA (International Aerospace Abstracts), the documents cited include research reports, journal articles, conference presentations, patents and patent applications, and theses. A.R.H.

N85-22256*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL HIGHLIGHTS, 1983
[1984] 101 p Original contains color illustrations
(NASA-CR-175558; NAS 1.26:175558) Avail: NTIS HC A06/MF A01 CSCL 05B

The most significant accomplishments during fiscal year 1983 in a wide range of ongoing research and development tasks at the Jet Propulsion Laboratory are discussed. Deep space exploration, information systems and space technology development, technology applications, energy and energy conversion technology, and Earth observational systems are discussed. R.J.F.

N85-22257# Royal Aircraft Establishment, Farnborough (England).
LIST OF RAE (ROYAL AIRCRAFT ESTABLISHMENT) TRANSLATIONS ISSUED DURING THE PERIOD 1 MARCH 1983 - 31 MARCH 1984
P. O. Flint Mar. 1984 8 p
(AD-A149787; RAE-LIBRARY BIB-383; DRIC-BR-92835) Avail: NTIS HC A02/MF A01 CSCL 05/2

This list covers all Royal Aircraft Establishment translations published from 1 March 1983 to 31 March 1984 and follows Library Bibliography 381. Previous lists have been issued in Library Bibliographies 243, 249, 254, 261, 283, 313, 319, 324, 330, 353, 360, 366, 369, 373, 380 and 381. GRA

N85-22258# Office of Naval Research, London (England).
THE EEC'S INFORMATION TECHNOLOGY PROGRAM: AN UPDATE
J. F. Blackburn 18 Dec. 1984 11 p
(AD-A150022; ONRL-R-13-84) Avail: NTIS HC A02/MF A01 CSCL 09/2

The primary goal of the European Strategic Program for Research and Development in Information Technology (ESPRIT) is to make the countries of the European Economic Community competitive in the world market for information technology. This report examines the five areas of the ESPRIT program for 1985: advanced microelectronics, software technology, advanced information processing, office systems, and computer-integrated manufacturing. GRA

N85-22259# California Univ., Berkeley. Lawrence Berkeley Lab.
REQUIREMENTS FOR A DATABASE MANAGEMENT SYSTEM
J. D. Lawrence and J. McCarthy Sep. 1984 12 p refs
(Contract DE-AC03-76SF-00098)
(DE85-004661; LBL-18504) Avail: NTIS HC A02/MF A01

The requirements for a database management system that would satisfy the scientific needs of the Scientific Database Project are discussed. Actual requirements, for each category, are identified as mandatory, important, and optional. A DBMS would not be considered unless it satisfies all mandatory requirements. DOE

N85-22260# Battelle Columbus Labs., Ohio.
EVALUATION OF THE VOCABULARY SWITCHING SYSTEMS Final Report, 1 Oct. 1979 - 31 Oct. 1984
Robert Niehoff and Greg Mack Aug. 1984 205 p refs Submitted for publication
(Grants NSF IST-79-11190; NSF IST-81-11497)
(PB85-127157) Avail: NTIS HC A10/MF A01 CSCL 05B

The Vocabulary Switching System (VSS) is an experimental system designed to enhance search strategies and ultimately retrieval performance for those who use online bibliographic data bases. VSS contains 15 indexing and retrieval vocabularies from 12 different suppliers. By fully integrating these vocabularies into

common VSS files the VSS user has access to about 315 thousand possible search terms. VSS assists users with free-text or controlled-vocabulary searches and single or multiple data base searches. This report describes research efforts undertaken to: (1) modify and expand VSS from an earlier more primitive version; and (2) evaluate VSS in end-user and intermediary communities in real-life situations. Author (GRA)

N85-22261# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS, TREE STRUCTURES, 1985
Jul. 1984 474 p
(PB84-216092; NLM/MED-84/04) Avail: NTIS HC A20/MF A01 CSCL 05B

All Medical Subject Headings currently in use by the National Library of Medicine's indexers, catalogers, and searchers are arranged in a hierarchical manner showing relationships between broader and narrower terms. Included are minor and geographic descriptors. GRA

N85-22262# National Library of Medicine, Bethesda, Md.
PERMUTED MEDICAL SUBJECT HEADINGS, 1985
Jul. 1984 384 p
(PB84-216100; NLM/MED-84/05) Avail: NTIS HC A17/MF A01 CSCL 05B

Permuted Medical Subject Headings, 1985, is a computer generated display of all terms, i.e., descriptors and cross references. In the alphabetic list of the National Library of Medicine's Medical Subject Headings (MeSH) for 1985, as well as all citation type, check tag, and geographic descriptive in the Annotated Alphabetic MeSH, 1985. The Permuted MeSH takes each significant word that appears in each MeSH term and then lists all the MeSH terms in which that word appears. GRA

N85-22263# American Embassy, Paris (France). Regional Technical Aids Center.
GLOSSARY OF THE SOIL SCIENCES
C. E. Ferguson 1984 89 p
(PB85-133452; TECHNIQUES-AMERICAINES-SER-140; AID-PN-AAL-336) Avail: NTIS HC A05/MF A01 CSCL 08M

A French/English and English/French glossary of terms currently used by soil scientists is presented for use by students specializing in agronomy and soil science and by translators of specialized documents. The glossaries are followed by a list of 200 English verbs and 200 French verbs frequently used in soil science. GRA

N85-21949# Joint Publications Research Service, Arlington, Va.
MODEL OF INFORMATION-REFERENCE DIALOGUE SYSTEM FOR WORKING WITH DOCUMENT ABSTRACTS
O. N. Rustamyan and V. K. Vasilyev *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 18, No. 6, Nov. - Dec. 1984 (JPRS-USB-85-002) 21 Feb. 1985 p 106-112 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 6, Nov. - Dec. 1984 p 73-76 (For primary document see N85-21931 12-51)
Avail: NTIS HC A08

N85-22211*# Furman Univ., Greenville, S.C. Dept. of Computer Science.
USING A DATA BASE MANAGEMENT SYSTEM FOR MODELLING SSME TEST HISTORY DATA
Kenneth Abernethy *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 24 p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05B

N85-22242*# Lambuth Coll., Jackson, Tenn. Dept. of Mathematics and Computer Science.
THE INTELLIGENT DATABASE MACHINE
Kenneth E. Yancey *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 21p refs (For primary document see N85-22210 12-80)
Avail: NTIS HC A99/MF E03 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-21215*# National Aeronautics and Space Administration, Washington, D. C.
THE INTERNATIONAL ENVIRONMENT UNISPACE '82 AND THE ITU: A RELATIONSHIP BETWEEN ORBIT-SPECTRUM RESOURCE ALLOCATION AND ORBITAL DEBRIS
Dean Olmstead *In* NASA. Lyndon B. Johnson Space Center Orbital Debris Mar. 1985 p 372-378 (For primary document see N85-21188 12-12)
Avail: NTIS HC A20/MF A01 CSCL 05D

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-22264# Office of Technology Assessment, Washington, D.C.
TECHNOLOGY TRANSFER TO THE MIDDLE EAST
Sep. 1984 615 p
(PB85-127744; OTA-ISC-173; LC-84-601109) Avail: NTIS HC A99/MF A01 CSCL 05A

The policy issues surrounding technology transfer to developing countries are discussed by highlighting tradeoffs among various commercial, political and development assistance policy goals, and by suggesting options for more consistent policies affecting technology transfer to developing countries. A region of great strategic importance where significant development efforts during the past decade involved the introduction of technology from the United States and other supplier countries were studied. Competition among suppliers of technology, and problems the recipients face in effectively utilizing advanced civilian technologies in five sectors: petrochemical production, telecommunications systems, commercial aircraft support systems, medical services and nuclear power are presented. The policy perspectives of the recipient and supplier countries are evaluated. US policy options in light of an evaluation of future prospects for Middle East technology trade are identified. GRA

88 SPACE SCIENCES (GENERAL)

N85-22265# National Bureau of Standards, Washington, D.C. Electromagnetic Fields Div.
PRELIMINARY INVESTIGATION INTO USING THE SUN AS A SOURCE FOR G/T (GAIN TO SYSTEM NOISE TEMPERATURE)

MEASUREMENTS
William C. Daywitt Aug. 1984 23 p refs
(PB85-128148; NBSIR-84-3015) Avail: NTIS HC A02/MF A01 CSCL 09E

A preliminary investigation into determining the solar flux density, the atmospheric correction factor, and the star shape correction factor for use in G/T measurements above 5 GHz was conducted. An estimate of errors is also included. Preliminary results show an improved algorithm for determining diffusive and refractive attenuation, a viable technique for estimating the solar flux density from daily AFGL flux density measurements and a centimeter/millimeter wave spectrum function, and the possibility of reducing star shape correction factor errors by use of an effective solar RF diameter. Author (GRA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-22266*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
DEVELOPMENT OF HIGH RESOLUTION IMAGING DETECTORS FOR X-RAY ASTRONOMY Semiannual Progress Report, 1 Apr. 1982 - 31 Mar. 1985
Stephen S. Murray and Daniel A. Schwartz Mar. 1985 25 p
(Grant NAG5-605)
(NASA-CR-175505; NAS 1.26:175505; SAPR-1; SAPR-2; SAPR-3; SAPR-4; SAPR-5; SAPR-6) Avail: NTIS HC A02/MF A01 CSCL 03A

High (spatial) resolution imaging detectors for X-ray astronomy were developed. Several prototype detectors built and their feasibility and baseline performance were assessed. Two of these detector types are proposed for investigations on the advanced X-ray astrophysics facility (AXAF). The readiness of a new X-ray imaging system, the charge coupled device (CCD) imaging spectrometer is outlined, and state of the art performance parameters for microchannel plate (MCP) and CCD detectors are measured. Laboratory facilities and procedures for coating MCP are developed general high resolution imagery systems are analyzed. E.A.K.

N85-22267*# Space Telescope Science Inst., Huntsville, Ala.
IRAS OBSERVATIONS OF SEYFERT GALAXIES
G. K. Miley, G. Neugebauer, and B. T. Soifer (California Inst. of Technology) [1985] 16 p refs Sponsored in part by JPL
(NASA-CR-175557; NAS 1.26:175557) Avail: NTIS HC A02/MF A01 CSCL 03A

Infrared Astronomy Satellite measurements at 25, 60 and 100 microns were used to analyze the infrared properties of Seyfert galaxies from the Markarian and NGC Catalogs. One hundred and sixteen of 186 Seyfert galaxies were detected. About 50% of all Seyfert galaxies in the sample have 60 micron luminosities in excess of 10 to the 10th power solar luminosity, and the mean 60 micron luminosity increase with the optical B absolute magnitude. The luminosity functions of the Seyfert 1 and Seyfert 2 galaxies appear quite similar. It is possible, however, to statistically separate the two types of galaxies in color-color plots. The 100- to 60- micron energy distributions flatten systematically with increasing 60- micron luminosity. The infrared measurements provide a measure of the bolometric luminosity of the Seyfert galaxies, but do not discriminate between the physical processes involved. M.G.

N85-22268*# Arizona Univ., Tucson.
THE ULTRAVIOLET EXCESS OF QUASARS 3: THE HIGHLY POLARIZED QUASARS PKS 0736+017 AND PKS 1510-089
Matthew A. Malkan and Richard L. Moore (Aerospace Corp.) [1985] 33 p refs
(Grant NAG5-337)
(NASA-CR-175576; NAS 1.26:175576) Avail: NTIS HC A03/MF A01 CSCL 03A

Ultraviolet/optical/infrared spectrophotometry of the highly-polarized quasars (HPQ's) PKS 0736+017 and PKS 1510-089 is analyzed. A blazar continuum component like that in BL Lac objects (e.g., with violent variability, high polarization, and a steep power-law shape) contributes about half the visual light of 1510-089, and at least three-quarters of that in 0736+017. The remaining light has the same spectrum as normal (low-polarization) quasars, including an ultraviolet excess or blue bump, which is easily detected in the IUE spectra of 1510-089, and weakly detected in 0736+017. The line fluxes do vary, but not as much as the continuum. The ratios of the broad emission lines, and the Balmer continuum are normal in both quasars. M.G.

N85-22269*# Wisconsin Univ., Madison. Dept. of Astronomy.
A SURVEY OF Mg II h AND k EMISSION IN NEAR-SOLAR TYPE STARS
L. R. Doherty 28 Dec. 1984 18 p refs
(Grant NsG-5242)
(NASA-CR-175572; NAS 1.26:175572) Avail: NTIS HC A02/MF A01 CSCL 03A

International Ultraviolet Explorer measurements of Mg II h and k emission fluxes are presented for 30 F and G stars that are on or near the main sequence and compared with Wilson's measurements of the Ca II H and K fluxes in these stars. The survey includes a large proportion of stars with very low chromospheric activity as well as 111 Tau, X(1) Ori and other examples of strong chromospheric emission. Emission cores are presented in all of the stars observed. A sharp lower limit to the flux in the cores of the k lines implies the existence of a minimum level of chromospheric activity in which the k line flux is a constant fraction of stellar luminosity. Reduction of Wilson's values to absolute fluxes produces a close correlation between Mg and Ca strength with possibly some dependence on color. For the most active stars, the Mg k and Ca fluxes are consistent with the presence of solar plage covering up to one half of the stellar surface. However, the ratio of k to h in these stars is much less than this simple interpretation predicts. M.G.

N85-22288*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
X-RAY ASTRONOMY AND PLASMA ASTROPHYSICS
C. R. Canizares *In* ESA Plasma Astrophys. Nov. 1984 p 159-168 refs Sponsored by Alfred P. Sloan Fellowship (For primary document see N85-22270 12-90)
(Contract NAS8-30752)
Avail: NTIS HC A15/MF A01 CSCL 03B

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-22270# European Space Agency, Paris (France).
PLASMA ASTROPHYSICS
T. D. Guyenne, comp. and J. J. Hunt, comp. Nov. 1984 349 p refs Proc. of Intern. School and Workshop on Plasma Astrophys., Varenna, Italy, 28 Aug. - 7 Sep. 1984; sponsored by Milan Univ., ESA, Energia Nucleare e delle Energie Alternative, Camera di Commercio di Como, CNR, Regione Lombardia and Gilardoni SPA Mandello Sul Lario
(ESA-SP-207; ISSN-0379-6566) Avail: NTIS HC A15/MF A01

Solar plasma; heliosphere; collapsed stars; galactic plasmas; cosmic rays and X-ray astronomy; cosmology; and Earth magnetosphere were discussed. For individual titles, see N85-22271 through N85-22321.

N85-22271# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
SPACE RESEARCH AND THE NEW APPROACH TO THE MECHANICS OF FLUID MEDIA IN COSMOS
Hannes Alfven and Franz Cech *In* ESA Plasma Astrophys. Nov.

1984 p 3-24 refs Presented at 16th Intern. Congr. of Theoret. and Appl. Mech., Lyngby, Denmark, 19-25 Aug. 1984 Sponsored by Swedish Natural Science Research Council (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The use of in situ magnetospheric results in cosmology is discussed. Extrapolation of magnetospheric results makes it necessary to revise the evolutionary history of interstellar dust clouds and the formation of stars, including the Sun and the solar nebula, out of which our planetary system derived. The formation of planets and satellites can also be approached by an extrapolation backwards in time of magnetospheric results. A combination of these methods makes it possible to reconstruct events 4 to 5 billion years ago with an accuracy of a few percent. This reconstruction is based on the Pioneer and Voyager measurements of the highly structurized Saturnian rings. These can be regarded as a time capsule which registered decisive processes leading to the formation of our solar system. Author (ESA)

N85-22272*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
DISCOVERY OF THE SOLAR WIND **c92**
B. Rossi *In* ESA Plasma Astrophys. Nov. 1984 p 27-32 refs (For primary document see N85-22270 12-90)
(Grant NGL-22-009-015)
Avail: NTIS HC A15/MF A01 CSCL 03B

The Explorer 10 satellite experiment which, in 1961, produced the first direct evidence of a solar wind, measured its density and its velocity, and established the existence of a region of space (the geomagnetic cavity) that surrounds the Earth and is shielded from the solar wind by the Earth's magnetic field is described. Author (ESA)

N85-22273# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
VELOCITY DISTRIBUTIONS OF SOLAR WIND IONS AND ELECTRONS **c92**
E. Marsch *In* ESA Plasma Astrophys. Nov. 1984 p 33-40 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Solar wind ion and electron three-dimensional velocity distributions are presented emphasizing Helios measurements between 0.3 and 1 AU. The observed distributions strongly deviate from Maxwellians. Their detailed form distinctly correlates with the magnetic sector and solar wind stream structure. Among the most prominent non-thermal features are temperature anisotropies, heat fluxes, double ion streams, differential motion between protons and alpha particles, and narrow field-aligned electron strahl. Individual spectra are discussed and statistical results are presented. Kinetic processes which may shape the particle distributions, in particular the effects of Coulomb collisions, are considered. A plasma stability analysis for magnetosonic waves is mentioned. Author (ESA)

N85-22274*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
MAGNETOSPHERES IN THE SOLAR SYSTEM
R. L. McNutt *In* ESA Plasma Astrophys. Nov. 1984 p 41-48 refs (For primary document see N85-22270 12-90)
(Contract JPL-953733)
Avail: NTIS HC A15/MF A01 CSCL 03B

Intrinsic and induced magnetospheres of planets, moons, and comets in the solar system are described. Magnetospheric electric fields, the plasmasphere, rotational effects, and corotation and convection dominated intrinsic magnetospheres are considered. Supersonic and subsonic interactions in induced magnetospheres are discussed. Author (ESA)

N85-22275*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTICLE TRANSPORT IN PLANETARY MAGNETOSPHERES **c91**
T. J. Birmingham *In* ESA Plasma Astrophys. Nov. 1984 p 49-56 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 06C

Particle energization in Earth's and Jupiter's magnetospheres is discussed. Understanding of the large scale magnetic and electric fields in which charged particles move is reviewed. Orbit theory in the adiabatic approximation is sketched. General conditions for adiabatic breakdown at each of three levels of periodicity are presented. High energy losses and lower energy sources argue for the existence of magnetospheric accelerations. Nonadiabatic acceleration processes are mentioned. Slow diffusive energization by particle interactions with electromagnetic fluctuations is outlined. This mechanism seems adequate at Earth but, operating alone, is unconvincing for Jupiter. Adding spatial diffusion in the radially distended Jovian magnetodisk may resolve the difficulty. Author (ESA)

N85-22276# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
ACTIVATION OF SOLAR FLARES **c92**
P. J. Cargill, S. Migliuolo, and A. W. Hood (Napier Coll.) *In* ESA Plasma Astrophys. Nov. 1984 p 57-63 refs Sponsored by NSF (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The physics of the activation of two-ribbon solar flares via the MHD instability of coronal arcades is presented. The destabilization of a preflare magnetic field is necessary for a rapid energy release, characteristic of the impulsive phase of the flare, to occur. The stability of a number of configurations are examined, and the physical consequences and relative importance of varying pressure profiles and different sets of boundary conditions (involving field-line tying) are discussed. Instability modes, driven unstable by pressure gradients, are candidates for instability. Shearless vs. sheared equilibria are also discussed. Author (ESA)

N85-22277# Academy of Sciences (USSR), Leningrad. Technical Inst. of Physics.
PLASMA AND NUCLEAR PROCESSES IN SOLAR MATTER **c92**
G. E. Kocharov *In* ESA Plasma Astrophys. Nov. 1984 p 65-81 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Plasma and nuclear processes in the interior of the Sun and solar atmosphere are reviewed. A serious discrepancy between the standard theory and experiment on detecting neutrinos, born deep in the interior of the Sun, is discussed from plasma and nuclear processes point of view. Particle and photon generation are considered, based on the experimental results of simultaneous registration of different particles and radiations. Zones where the particle acceleration occurs; characteristics of the solar flare accelerator; and the physical conditions in the solar plasma before the flare, during and after it are discussed. Author (ESA)

N85-22278*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRON AND GAMMA-RAY SIGNATURES FOR PARTICLE ACCELERATION IN SOLAR FLARES **c93**
R. Ramatay and R. J. Murphy (Maryland Univ., College Park) *In* ESA Plasma Astrophys. Nov. 1984 p 83-90 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 03B

The production of neutrons, 4 to 7 MeW nuclear gamma rays, positrons and pions resulting from the interaction of flare accelerated particles with the solar atmosphere was calculated. For the energy spectra of these particles the Bessel function predicted by stochastic acceleration and power laws which could result from acceleration at large-scale planar shocks was used, with the thick-target model. It is assumed that in the interaction region the accelerated particles are isotropic. The neutron-to-2.223 MeV photon conversion factors for various flare locations on the Sun are derived by averaging conversion factors over these spectra. Comparing calculations with data confirms that for most gamma-ray flares the bulk of the accelerated particles remain trapped at the

Sun and that these particles have spectra similar to the spectra of flare particles observed in interplanetary space. Author (ESA)

N85-22279# Sussex Univ., Brighton (England). Astronomy Center.
THE AXISYMMETRIC PULSAR MAGNETOSPHERE
L. Mestel *In* ESA Plasma Astrophys. Nov. 1984 p 93-99 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

A model for the steady spin-down of an aligned rotating magnetic neutron star, within the framework of classical physics is proposed. The electron currents which exert the braking torque on the star flow from the polar caps out to and beyond the light-cylinder, where they emit gamma radiation; the associated loss of angular momentum enables the currents to cross field lines and so return to the star at lower latitudes. The high energies retained by some electrons returning to the strong magnetic regions near the star suggest that the model would spontaneously convert into a quantum magnetosphere, with pair production continually triggered by the circulating primary electrons. Author (ESA)

N85-22280# Abastumani Astrophysical Observatory, Georgia (USSR).
ON THE SPECTRUM OF LONGITUDINAL WAVES IN THE HOT DEGENERATE PLASMA c75
J. G. Lominadze, G. I. Melikidze, V. P. Silin (Academy of Sciences, Moscow), and V. N. Ursov (Academy of Sciences, Moscow) *In* ESA Plasma Astrophys. Nov. 1984 p 101-103 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The longitudinal wave spectra in the hot degenerate plasma, having Fermi distribution - both one and three dimensional, are studied in the whole range of wave vectors. In the frames of classical mechanics, the relativistic and nonrelativistic cases are examined. The real and imaginary parts of the solutions of the dispersion equation are found. It is shown that the spectra asymptotics are not connected with strong Landau damping. Author (ESA)

N85-22281# Abastumani Astrophysical Observatory, Georgia (USSR).
NONLINEAR WAVES IN THE MAGNETOSPHERE OF PULSARS
A. D. Pataraya and B. B. Chargeishvili *In* ESA Plasma Astrophys. Nov. 1984 p 105-107 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The dispersion relations and growth rates of linear waves propagating across the external magnetic field in electron-positron plasmas (EPP) are derived. The basic distribution function is presumed to be a one dimensional power function. The effects of polarization plane rotation of linear waves due to Coriolis force and mixture of heavy particles in EPP are investigated. Weak nonlinear waves are also studied. Author (ESA)

N85-22282# Scuola Normale Superiore, Pisa (Italy).
DYNAMICS OF ELLIPTICAL GALAXIES AND THE r SUP 1/4 LUMINOSITY LAW
G. Bertin and M. Stiavelli *In* ESA Plasma Astrophys. Nov. 1984 p 111-113 refs Sponsored by MPI and CNR (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Evidence that elliptical galaxies are mostly pressure supported systems whose luminosity profiles follow an empirical law with striking regularity is discussed. Theoretical considerations and N-body simulations suggest that these galaxies should be described by a distribution function dependent on three integrals of the motion. The properties of a family of self-consistent equilibrium models that provides a natural dynamical basis for the luminosity law of elliptical galaxies are illustrated. Author (ESA)

N85-22283# Scuola Normale Superiore, Pisa (Italy).
ON THE MORPHOLOGY OF SPIRAL MODES
G. Bertin, C. C. Lin, and S. A. Lowe *In* ESA Plasma Astrophys. 4 Nov. 1984 p 115-120 refs Sponsored by CNR and NSF (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

A dynamical basis for Hubble's morphology classification of galaxies is given by combining the existing theory for normal spirals composed of two trailing waves with a similar theory for open spirals composed of one leading wave and one trailing wave. This identifies the two classes of spiral modes which form the prototypes for the two prongs of the tuning fork in the Hubble classification. The existence of transition spirals and bar-driven spirals is recognized. The relevant physical regimes of the dynamical parameters are those for which modes are moderately growing, consistent with the hypothesis of quasi stationary spiral structure. Author (ESA)

N85-22284# Massachusetts Inst. of Tech., Cambridge.
ON A SPECTRAL THEORY OF THE EXCITATION MECHANISM OF GALACTIC SPIRALS
C. C. Lin and R. P. Thurstans *In* ESA Plasma Astrophys. Nov. 1984 p 121-130 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Spectral theory is developed to bring out the relationship between swinging wave packets and exponentially growing wave trains in the conventional infinite sheet model with uniform differential galactic rotation. Results are compared with those based on the local dispersion relationship for wave trains. General agreement is found. It is pointed out that there may be coexistence of quasi-stationary grand designs with transient spiral features that evolve at a rate comparable to that of shear. The quasi-stationary state may be expected only for certain regimes of dynamical parameters. Author (ESA)

N85-22285# Abastumani Astrophysical Observatory, Georgia (USSR).
THERMAL CONVECTION AND MAGNETIC FIELDS IN ACCRETION DISKS OF BLACK HOLES
G. D. Chagelishvili and J. G. Lominadze *In* ESA Plasma Astrophys. Nov. 1984 p 131-138 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The processes preceding the formation of a hot optically thin corona in the inner region of an accretion disk (IRAD) of black holes were studied. Thermal convection in IRAD was studied in the presence of differential rotation and a toroidal magnetic field. It is found that the magnetic field suppresses thermal convection only when its pressure becomes comparable with that of radiation. The equations of the turbulent dynamo are used to show that in IRAD the toroidal component of a large scale magnetic field increases, reaching its maximum value in a sufficiently short time. It is shown that a small scale magnetic field, appearing as a result of the large scale magnetic field entanglement by the convective turbulence, remains several times weaker than the toroidal component of the large scale magnetic field. Author (ESA)

N85-22286# Academy of Sciences (USSR), Moscow. Inst. of General Physics.
COSMIC RAY GENERATION BY PLASMA TURBULENCE: DEVELOPMENT OF A NEW PARADIGM IN PHYSICS c93
V. N. Tsytovich *In* ESA Plasma Astrophys. Nov. 1984 p 141-152 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Cosmic ray generation by magnetohydrodynamic turbulence is compared with electrostatic plasma turbulence. A mechanism of cosmic ray generation due to radiative processes is described. It is shown that the main properties of cosmic rays can be explained by this mechanism. Author (ESA)

N85-22287# Central Research Inst. for Physics, Budapest (Hungary).
COSMIC RAY COMPOSITION AND ORIGIN c93
P. Kiraly *In* ESA Plasma Astrophys. Nov. 1984 p 153-157 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

Cosmic ray (CR) elemental and isotopic compositions are discussed. Elemental composition at the sources is similar to a local galactic composition modified by a first ionization potential dependent bias. While H and He are underabundant in CR source compositions, C and Z > 60 elements are probably overabundant. Some isotopic ratios are different in CR source and local group composition, the most important discrepancy being the high 22Ne/20Ne ratio. Overabundance of C and most anomalous isotopic ratios can be explained by a 2% to 3% contribution of Wolf-Rayet stars to the primary CR particles, and by a metallicity gradient in the galaxy. The interstellar matter penetrated by cosmic rays decreases with increasing rigidity, at least up to 100 GeV/nucleon. The calculated source spectra of abundant nuclei are consistent with power spectra in momentum from 5 to 100 GeV/nucleon. Author (ESA)

N85-22288*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.

X-RAY ASTRONOMY AND PLASMA ASTROPHYSICS **c89**

C. R. Canizares *In* ESA Plasma Astrophys. Nov. 1984 p 159-168 refs Sponsored by Alfred P. Sloan Fellowship (For primary document see N85-22270 12-90)
(Contract NAS8-30752)
Avail: NTIS HC A15/MF A01 CSCL 03B

X-ray astronomy studies of thin, thermal plasmas in stellar coronas, supernova remnants, and clusters of galaxies are reviewed. Plasma diagnostics for density, temperature and elemental abundance, as well as for departures from ionization equilibrium are described. These were used in analyses of data from imaging and spectroscopic intruments on the Einstein satellite. Results of these diagnostics were used to study the nature of coronal loops in RS CVn stars; the masses and abundances in Type I and Type II supernova remnants with implications for stellar evolution and the enrichment of the interstellar medium; the structure of the interstellar medium; the quantity and distribution of dark matter in galaxy halos; and the existence of cooling accretion flow in clusters. Author (ESA)

N85-22289# Oxford Univ. (England). Dept. of Astrophysics.

COSMOLOGY, GALACTIC ASTRONOMY AND ELEMENTARY PARTICLE PHYSICS

D. W. Sciama *In* ESA Plasma Astrophys. Nov. 1984 p 171-178 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The inflationary universe; the primordial synthesis of baryons and the light elements; and the possible roles of massive neutrinos, photinos and gravitinos in providing the missing matter in the Universe as a whole, in galaxy clusters and in individual galaxies are discussed. It is suggested that massive elementary particles provide a very natural explanation of missing matter because they would be pair-produced in profusion in the hot Big Bang, and would survive until the present day for a wide range of their relevant parameters. Author (ESA)

N85-22290# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).

SELF-SIMILAR MODIFIED SHOCK STRUCTURES **c93**

R. Beck and L. OCDrury *In* ESA Plasma Astrophys. Nov. 1984 p 181-184 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Time dependent shock structures for a three fluid system including gas, mildly relativistic particles and ultrarelativistic particles are obtained by considering self-similar solutions of the ideal hydrodynamical equations. The effective diffusion coefficient of the ultrarelativistic particles is assumed to be spatially constant but to increase linearly with time. The diffusive particle acceleration process turns out to be very efficient, with overall compressions in the range 10 to 20 although no energy loss from the system occurs. Author (ESA)

N85-22291# Toyama Univ. (Japan). Dept. of Applied Mathematics and Physics.

FORCED RECOGNITION BY NONLINEAR MHD WAVES AND SEQUENTIAL TRIGGERING OF SOLAR FLARES **c92**

J. Sakai, T. Tajima (Texas Univ., Austin), and F. Brunel (Texas Univ., Austin) *In* ESA Plasma Astrophys. Nov. 1984 p 185-187 refs (For primary document see N85-22270 12-90)
(Grant NSF ATM-82-14730; Contract DE-FG05-80ET-53088)
Avail: NTIS HC A15/MF A01

Fast magnetic reconnection induced in plasmas by external nonlinear MHD waves was studied by MHD particle simulation. Results show that a threshold amplitude for the external MHD waves exists. When there is no toroidal magnetic field, fast reconnection takes place more easily. As the toroidal field becomes stronger, the reconnection process with waves becomes slower or more difficult. The fast reconnection induced by external MHD waves may explain sequential triggering of solar flares. The coalescence process of magnetic islands can also play a vital role in facilitating rapid reconnection as well as high energy particle production. Author (ESA)

N85-22292# Toyama Univ. (Japan). Dept. of Applied Mathematics and Physics.

EXPLOSIVE TRANSVERSE ELECTRIC FIELD AND PARTICLE ACCELERATION DURING MAGNETIC COLLAPSE

J. Sakai, T. Tajima (Texas Univ., Austin), and R. Sugihara (Nagoya Univ., Japan) *In* ESA Plasma Astrophys. Nov. 1984 p 189-192 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

It is shown that ion streams across the magnetic field moving with electrons cause explosive transverse electrostatic field during magnetic collapse such as coalescence instability of current loops. The electrostatic field can explosively accelerate ions and electrons perpendicular both to the magnetic field and ion streams. Ions and electrons are almost simultaneously accelerated in the opposite direction. These results explain simulation results of collisionless coalescence instability of current loops. The simultaneous acceleration mechanism of ions and electrons is applied to the origin of explosive high energy particles in cosmic plasmas. Author (ESA)

N85-22293*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SIGNATURES OF THE COALESCENCE INSTABILITY IN SOLAR FLARES **c92**

H. Nakajima, T. Tajima (Texas Univ., Austin), F. Brunel (Texas Univ.), and J. Sakai (Toyama Univ., Japan) *In* ESA Plasma Astrophys. Nov. 1984 p 193-196 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 03B

Double sub-peak structures in the quasi periodic oscillations in the time profiles of solar flares in 1980 and 1982 are discussed. Computer simulations of the coalescence instability of two current loops agree with observations of the (widely differing) flares. The simultaneous accelerations of electrons and ions, and the double sub-peak structure in quasi periodic pulses are well explained. The double sub-peak structure is more pronounced when the currents in the two loops are sufficient for fast coalescence to occur. This corresponds to the 1980 flare. When the currents are insufficient for fast coalescence, the double sub-peak structure is less pronounced, as in the 1982 flare. Observations suggest the collision of the two microwave sources for the 1982 event. It is argued that this mechanism is a plausible particle acceleration mechanism in solar flares. Author (ESA)

N85-22294*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

NONLINEAR EVOLUTION OF ASTROPHYSICAL ALFVEN WAVES

S. R. Spangler *In* ESA Plasma Astrophys. Nov. 1984 p 197-200 refs (For primary document see N85-22270 12-90)
(Grants NAGw-386; NSF AST-82-17714)
Avail: NTIS HC A15/MF A01 CSCL 03B

Nonlinear Alfven waves were studied using the derivative nonlinear Schrodinger equation as a model. The evolution of initial

conditions, such as envelope solitons, amplitude-modulated waves, and band-limited noise was investigated. The last two furnish models for naturally occurring Alfven waves in an astrophysical plasma. A collapse instability in which a wave packet becomes more intense and of smaller spatial extent was analyzed. It is argued that this instability leads to enhanced plasma heating. In studies in which the waves are amplified by an electron beam, the instability tends to modestly inhibit wave growth. Author (ESA)

N85-22295# Universidad Politecnica de Madrid (Spain). Dept. de Energia Nuclear.

OPACITY DETERMINATIONS FOR INERTIAL CONFINEMENT FUSION (ICF) MATERIALS USING AN AVERAGE ATOM MODEL c75

G. Velarde, J. M. Aragones, C. Cabezudo, J. J. Honrubia, J. M. Martinez-Val, E. Minguez, J. L. Ocana, J. M. Perlado, and J. F. Serrano *In* ESA Plasma Astrophys. Nov. 1984 p 201-204 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

A calculation model to obtain opacity data for the most useful materials in inertial confinement fusion targets is presented. Two modular computer codes were developed. Pandora module uses an average atom model with screening constants to determine the atomic structure. Geminis uses semiclassical opacity formulas to calculate the bound-bound, bound-free, free-free transitions and scattering. Two libraries are available: LIB 1 is a set of Rosseland and Planck mean opacities, LIB 2 is frequency dependent opacities. Author (ESA)

N85-22296*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ELECTRON-POSITRON PAIR EQUILIBRIUM IN STRONGLY MAGNETIZED PLASMAS c75

A. K. Harding *In* ESA Plasma Astrophys. Nov. 1984 p 205-208 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01 CSCL 20I

Steady states of thermal electron-positron pair plasmas at mildly relativistic temperatures and in strong magnetic fields are investigated. The pair density in steady-state equilibrium, where pair production balances annihilation, is found as a function of temperature, magnetic field strength and source size, by a numerical calculation which includes pair production attenuation and Compton scattering of the photons. It is found that there is a maximum pair density for each value of temperature and field strength, and also a source size above which optically thin equilibrium states do not exist. Author (ESA)

N85-22297# Tokyo Univ. (Japan). Nobeyama Radio Observatory.

ELECTRON-POSITRON PAIRS IN A MILDLY RELATIVISTIC PLASMA IN ACTIVE GALACTIC NUCLEI c75

F. Takahara and M. Kusunose *In* ESA Plasma Astrophys. Nov. 1984 p 209-212 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

The electron-positron pair concentration in an optically thin mildly relativistic plasma is investigated. The equilibrium pair concentration is calculated when copious soft photons are supplied by the cyclotron higher harmonics. It is shown that the attainable states of a plasma are strongly restricted by the pair equilibrium condition. Pair production in the hot plasma produced by accretion onto a supermassive black hole is investigated, comparing relevant time scales. It is shown that the plasma becomes pair dominated if the accretion rate is moderately high and accretion flow is slow compared to free fall. The unsaturated Comptonization leads to the formation of a pair dominated plasma in most cases. Author (ESA)

N85-22298# Kharkov State Univ. (USSR). Inst. of Physics and Technology.

DRIFT-ACCRETION THEORY OF THE SPIRAL STRUCTURE OF GALAXIES

Y. N. Eliseev and K. N. Stepanov *In* ESA Plasma Astrophys. Nov. 1984 p 215-222 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

Spiral structure formation in galaxies with bar-like nucleus due to matter accretion onto the disk is considered. The matter flow patterns in the galactic plane in the corotation resonance region are constructed. The separatricies in these patterns are similar to the spiral arms of galaxies. It is shown that high density regions (spiral arms) arise near the separatrices as a result of matter accretion onto the disk. Peculiarities of spiral design are explained. The analogy with wave particle nonlinear interaction in plasma is pointed out. Author (ESA)

N85-22299# Jagellonian Univ., Cracow (Poland). Astronomical Observatory.

PLASMA IN THE CLUSTERS OF GALAXIES c75

A. Michalec *In* ESA Plasma Astrophys. Nov. 1984 p 223-224 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

Einstein Observatory data which support the power-law relation between the X-ray luminosity and the velocity dispersion proposed by Solinger and Tucker for rich clusters of galaxies are discussed. Investigation of the red shifts of individual clusters reveals that the power law relation is strongly altered when divided into two subgroups with different red shifts. It is concluded that, due to the small samples statistics and selection effects, it is not possible to draw definite conclusions as to the nature of physical processes in the intergalactic plasma from the observed index of the Solinger and Tucker relation. Author (ESA)

N85-22300# Ruhr Univ., Bochum (West Germany). Inst. of Astronomy.

SOME CONSTRAINTS ON MAGNETIC FIELDS IN GALACTIC SPIRAL ARMS

J. Spicker and J. V. Feitzinger *In* ESA Plasma Astrophys. Nov. 1984 p 225-228 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

Theories and observations of the longitudinal and vertical components of the magnetic fields in galactic spiral arms are summarized and constraints on the nature of this field in the light of investigations of the rolling motion phenomenon are presented. The vertical structures of HI spiral arms are explained in the context of the galactic fountain model and of vertical magnetic field components. The corrugation structure of the spiral arms sheds light on the magnetic field structure. Simple energetic requirements for the field are derived. Components of galactic spiral arms show equal scale properties, which can be understood in terms of the energy equipartition. Author (ESA)

N85-22301# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

PLASMA PROCESSES IN HERBIG-HARO OBJECTS c75

I. Axnaes, N. Brenning, and G. F. Gahm *In* ESA Plasma Astrophys. Nov. 1984 p 229-233 refs Sponsored by Swedish Natural Science Research Council (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

The UV excess from highly ionized elements in the high-excitation Herbig-Haro objects is discussed. It is proposed that it can be explained if a sheath is formed in the object, with heating in excess of ordinary shock wave calculations. Such a sheath could be the result of dynamo interaction between a Herbig-Haro cloudlet and a magnetized stellar wind, with a transverse magnetic field of the order of 0.1 mGauss. Author (ESA)

N85-22302# Turin Univ. (Italy). Ist. di Fisica Generale.

MECHANICAL ENERGY RELEASE BY PROTOSTARS TO MOLECULAR CLOUDS

G. Silvestro and M. Robberto *In* ESA Plasma Astrophys. Nov. 1984 p 235-236 refs (For primary document see N85-22270 12-90)

Avail: NTIS HC A15/MF A01

Outburst activity of low mass stars embedded in molecular

clouds is proposed as a source of energy at least comparable to winds from massive stars and protostars. Low-mass stars appear to have more intense activity than previously thought. They are more numerous and more evenly distributed within the cloud, and could play the main role in providing pressure support to the system. Author (ESA)

N85-22303# Clermont-Ferrand Univ. (France). Dept. de Mathematiques.
CONSERVED QUANTITIES AND RADIATIVE ASPECTS OF ASYMPTOTICALLY ANTI-DE SITTER SPACE-TIMES c77
A. Magnon *In* ESA Plasma Astrophys. Nov. 1984 p 237-238 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

A framework to describe the structures of asymptotically anti-de Sitter space-times is constructed. The resulting definition of conserved quantities is compared with that proposed by Abbot and Deser. Author (ESA)

N85-22304# Turin Univ. (Italy). Ist. di Fisica Generale.
DETERMINATION OF PHYSICAL PARAMETERS OF JETS IN RADIO GALAXIES
G. Grosso and A. Ferrari *In* ESA Plasma Astrophys. Nov. 1984 p 239-242 refs Sponsored by CNR (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The physical parameters of radio jets studied by the Very Large Array are discussed. The values determined do not differ from previous data on other sources by more than an order of magnitude. Jets appear to possess a narrow range of values of physical parameters, only slightly depending on the power of the central powerhouse. Uncertainties are still present, but increasing confidence in the parameters to which theories apply is expressed. The importance of studying complete samples by this method is crucial for understanding the intimate physics of jets. Author (ESA)

N85-22305# Turin Univ. (Italy). Ist. di Fisica Generale.
MAGNETOHYDRODYNAMIC (MHD) TURBULENCE IN RADIO GALAXIES c75
L. Zaninetti and G. Pelletier (Grenoble Univ., France) *In* ESA Plasma Astrophys. Nov. 1984 p 243-246 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The efficiency of turbulence produced by large hydrodynamic instabilities such as Kelvin-Helmholtz and internal shear to make radio jets shine is investigated. Assuming that most of the power of a turbulent cascade is absorbed by radiating particles, the contribution of hydrodynamic instabilities to the luminosity is deduced. The efficiency of the turbulent cascade is very sensitive to the variation of the Mach number and this could explain the morphological differences between low luminosity sources with supersonic flow and high luminosity sources with hypersonic flow. The theoretical luminosity derived is applied to a sample of extragalactic radio sources. Author (ESA)

N85-22306# Ecole Polytechnique, Palaiseau (France).
ABOUT STATIC AND DYNAMIC SOLUTIONS OF THE ALIGNED ROTATOR MODEL c75
E. Asseo, D. Beaufils, and R. Pellat *In* ESA Plasma Astrophys. Nov. 1984 p 247-250 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The possibility for a magnetospheric cold, force free, finite, non corotating plasma to be separated from a corotating plasma (including the neutron star) by a vacuum gap limited by two force-free surfaces is examined. It is concluded that axisymmetric vacuum bubbles cannot exist. Beams of particles which propagate up and down, along the magnetic dipole field lines, between the stellar surface and a non force-free surface located at a finite distance, beyond which vacuum exists are considered. There is no vacuum potential that can be linked to such a plasma potential. An alternative configuration is studied. Exchange of particles between the neutron star surface and a force-free magnetospheric plasma is possible if the resultant beams propagate into a magnetospheric plasma which has a positive charge density. Author (ESA)

N85-22307# International School for Advanced Studies, Trieste (Italy).
HYDRODYNAMICS OF ASTROPHYSICAL JETS c75
R. Turolla, M. Calvani (Padua Univ.), and L. Nobili (Padua Univ.) *In* ESA Plasma Astrophys. Nov. 1984 p 251-253 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

A model for the acceleration of jets in geometrically thick accretion disks is presented. The hydrodynamical equations for a non perfect, heat-conducting fluid are discussed. In the model, funnels are filled with fully ionized plasma that is continuously lost from the disk surface through a mechanism analogous to stellar wind. As a consequence of the competing action of gravitational and radiative forces a stagnation point, r0, exists in the funnels: for height along the funnel walls, $r > r0$ the gas is accelerated outwards while for $r < r0$ gravity prevails and the flow is directed inwards and ultimately swallowed by the hole. Author (ESA)

N85-22308# Bonn Univ. (West Germany). Inst. fuer Astronomische.
VISCOUS JETS c75
M. Nepveu *In* ESA Plasma Astrophys. Nov. 1984 p 255-257 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The starting flow is calculated around an object representing a central engine of an active galaxy that imparts momentum unidirectionally to its surroundings. Viscosity is used to mimic turbulence. A steady jet results for which the rate of entrainment of gas can be numerically computed. Comparison is made with analytical calculations. Author (ESA)

N85-22309# Turin Univ. (Italy). Ist. di Fisica Generale.
JETS IN GALAXIES c75
A. Ferrari *In* ESA Plasma Astrophys. Nov. 1984 p 259-273 refs Sponsored by CNR and MPI (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The dynamics of origin and propagation, and the radiation properties of galactic jets are reviewed. The incidence of jets in extragalactic sources; observational trends and physical parameters; physical problems in jet modeling; equilibrium configurations; and jet instability are discussed. Author (ESA)

N85-22310*# Turin Univ. (Italy).
EQUILIBRIUM MODEL OF THIN MAGNETIC FLUX TUBES c92
G. Bodo (Osservatorio Astronomica di Torino), A. Ferrari, S. Massaglia, W. Kalkofen (Harvard-Smithsonian Center for Astrophysics), and R. Rosner (Harvard-Smithsonian Center for Astrophysics) *In* ESA Plasma Astrophys. Nov. 1984 p 277-280 refs Sponsored by Italian Ministero della Pubblica Istruzione (For primary document see N85-22270 12-90)
(Grants NAGw-79; NAGw-253; NSF AST-83-03522; CNR-PSN-83-035)
Avail: NTIS HC A15/MF A01 CSCL 03B

The existence of a physically realizable domain in which approximations that lead to a self consistent solution for flux tube stratification in the solar atmosphere, without ad hoc hypotheses, is proved. The transfer equation is solved assuming that no energy transport other than radiative is present. Convective motions inside the tube are assumed to be suppressed by magnetic forces. Only one parameter, the plasma beta at tau = 0, must be specified, and this can be estimated from observations of spatially resolved flux tubes. Author (ESA)

N85-22311*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ARGUMENTS FOR FUNDAMENTAL EMISSION BY THE PARAMETRIC PROCESS L YIELDS T + S IN INTERPLANETARY TYPE III BURSTS c75

I. H. Cairns *In* ESA Plasma Astrophys. Nov. 1984 p 281-284 refs Sponsored by Sydney University Research Traveling Scholarship (For primary document see N85-22270 12-90)
(Contract NAS5-26819; Grant NGL-16-001-043)
Avail: NTIS HC A15/MF A01 CSCL 20I

Observations of low frequency ion acoustic-like waves associated with Langmuir waves present during interplanetary Type 3 bursts are used to study plasma emission mechanisms and wave processes involving ion acoustic waves. It is shown that the observed wave frequency characteristics are consistent with the processes L yields T + S (where L = Langmuir waves, T = electromagnetic waves, S = ion acoustic waves) and L yields L' + S proceeding. The usual incoherent (random phase) version of the process L yields T + S cannot explain the observed wave production time scale. The clumpy nature of the observed Langmuir waves is vital to the theory of IP Type 3 bursts. The incoherent process L yields T + S may encounter difficulties explaining the observed Type 3 brightness temperatures when Langmuir wave clumps are incorporated into the theory. The parametric process L yields T + S may be the important emission process for the fundamental radiation of interplanetary Type 3 bursts.
Author (ESA)

N85-22312*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A NEW RADIO EMISSION AT 3 kHz IN THE OUTER HELIOSPHERE c32
W. S. Kurth (Iowa Univ., Iowa City), D. A. Gurnett (Iowa Univ., Iowa City), F. L. Scarf (TRW Space Technology Labs., Redondo Beach, Calif.), and R. L. Poynter *In* ESA Plasma Astrophys. Nov. 1984 p 285-288 refs (For primary document see N85-22270 12-90)
(Grant NAGw-386; Contracts JPL-954012; JPL-954013)
Avail: NTIS HC A15/MF A01 CSCL 17B

Evidence of a radio source in the outer heliosphere based on observations made by the plasma wave receivers on Voyagers 1 and 2 at heliocentric radial distances ranging from 13 to 20 AU is given. The radio emission is observed in the frequency range 2 to 3 kHz, and is above the local electron plasma frequency whenever supporting plasma density data are available. The maximum spectral density of the emission is 10 to the minus 14 th power V sq/m/Hz. The bandwidth of the radio noise is 1 kHz. One possible source for the emission is radiation at the second harmonic of the plasma frequency at the heliopause. Author (ESA)

N85-22313# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
AN ANALYTIC MODEL FOR HYDROMAGNETOSPHERES
K. Tsinganos and B. C. Low (National Center for Atmospheric Research) *In* ESA Plasma Astrophys. Nov. 1984 p 289-292 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Steps needed to isolate a general solution of the complete hydromagnetic equations are outlined. In this solution, the axisymmetric magnetosphere that surrounds the central object consists of two regions. The first, around the magnetic equator, is controled by closed and dipole-like magnetic field lines wherein the plasma is in static equilibrium with the magnetic and gravitational fields. The second, around the magnetic axis, is controlled by flows along the open and monopole-like magnetic field lines. The total pressure is continuous everywhere and the solution is globally consistent. In the solar wind, for example, coronal holes can be associated with the region of open field lines and helmet streamer-type structures with the static regions of closed lines. In cosmic jets the accretion disk can be associated with the region of closed lines and the jet with the outflows along the open magnetic lines. Similar considerations may apply to the pulsar magnetosphere and bipolar flows from molecular clouds.
Author (ESA)

N85-22314# Milan Univ. (Italy). Dipt. di Fisica.
THE INFLUENCE OF THE LOCAL SOLAR WIND STRUCTURES ON THE PROPAGATION OF LOW ENERGY PARTICLES c92
M. Amati and C. Paizis *In* ESA Plasma Astrophys. Nov. 1984 p 293-296 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The role of high speed solar wind streams (HSS) in the confinement and propagation of low energy particles is investigated. A good correlation between the electron quiet time increases at 1AU (QTI) and the HSS is found. It is proposed that confinement and propagation in the local solar wind structures can explain the morphology of the QTI without invoking source effects. This interpretation is confirmed by data from the corotating nuclei events. Author (ESA)

N85-22315# Katholieke Universiteit te Leuven (Belgium). Astronomisch Inst.
THE CONTINUOUS SPECTRUM OF AN AXISYMMETRIC, SELF-GRAVITATING EQUILIBRIUM IN THE PRESENCE OF A POLOIDAL MAGNETIC FIELD c75
D. Hermans, M. Goossens, and S. Poedts *In* ESA Plasma Astrophys. Nov. 1984 p 297-300 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The continuous spectrum of oscillation frequencies is examined for an axisymmetric, self-gravitating equilibrium in the presence of a purely poloidal magnetic field. It is shown that the continuous spectrum is given by an eigenvalue problem of two uncoupled ordinary second orders differential equations along the magnetic field lines. The two decoupled continuous spectra have modes that are polarized either perpendicular or parallel to the magnetic field lines and may be called Alfven continuum and cusp continuum in analogy to the linear diffuse pinch. Curvature and toroidicity influence the two continua, but only the cusp continuum is affected by gravity and compressibility. Variational expressions for the continuum frequencies are derived and it is found that only the cusp continuum can attain negative values. The stability depends on the distribution of density, pressure, gravity, and magnetic field along the magnetic field lines. Author (ESA)

N85-22316# Ecole Polytechnique, Palaiseau (France).
SMALL SCALE STRUCTURE AND THE SPINAR MODEL FOR ACTIVE GALACTIC NUCLEI
E. Asseo *In* ESA Plasma Astrophys. Nov. 1984 p 303-306 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The properties of strong, low frequency electromagnetic waves associated with the magnetic oblique rotator model for active galactic nuclei (AGN) are studied. In the presence of a large scale magnetic field in the surroundings of AGN, the otherwise catastrophic Weibel instability is inefficient. A slower damping mechanism, associated to the radiation reaction of particles moving in and interacting with the strong waves, may lead to the formation of small scale (VLBI) structures. This may also explain VLBI features observed in the jets from extended extragalactic radio sources, if a precollimation process on larger scales is available.
Author (ESA)

N85-22317# Laval Univ. (Quebec). Dept. de Physique.
THE LUMINOSITY DISTRIBUTION OF PULSARS
S. Pineault *In* ESA Plasma Astrophys. Nov. 1984 p 307-309 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The luminosity distribution of pulsars is investigated and a gap in the middle of the observed distribution at log Lgap = 27.5 (cgs units) is found to be statistically significant. The implications are discussed in terms of the possible existence of two distinct pulsar luminosity classes, considering the standard magnetic dipole model, the disk model and a model in which superfluid neutron vortexes provide the dominant torque. An alternative explanation for the gap is that pulars either evolve very rapidly or temporarily cease to radiate as they reach the critical luminosity Lgap. Author (ESA)

N85-22318# Osservatorio Astronomico, Turin (Italy).
FORMATION OF OPTICAL-LINE EMITTING REGIONS IN THE

JETS OF SS433
G. Bodo *In* ESA Plasma Astrophys. Nov. 1984 p 311-314 refs Sponsored by CNR (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

It is shown that the collimated jets of SS433 accelerated in the funnels of thick accretion disks become thermally unstable outside these funnels and fragments in clumps which reach a stationary configuration at a temperature of about 10,000 K. These clumps can emit the optical lines observed. The density is such to produce the H alpha luminosity observed; the filling factor is small enough to reduce within acceptable limits the energetic requirements for powering this source with a stellar-size object. The condensations are in pressure equilibrium with the ambient hot phase, and move outwards at the same speed of the jet, which is determined by the acceleration phase inside the accretion disk funnels. The dispersion velocity of the clumps is very small, in agreement with the narrowness of the emission lines.
Author (ESA)

N85-22319# Milan Univ. (Italy). Dipt. di Fisica.
DISCRIMINANT ANALYSIS OF PULSAR GROUPS IN THE DIAGRAM P VERSUS P
M. Fracassini, L. E. Pasinetti, and G. Raffaelli *In* ESA Plasma Astrophys. Nov. 1984 p 315-317 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

The physical meaning of groups of pulsars (and gaps) in the diagram P vs P is analyzed by discriminant analysis. The use of the true age of pulsars allows orthogonal discriminant functions, F1 and F2 to be obtained. These give a better statistical estimate of the main physical parameters leading the distribution of pulsars in the diagram F1 vs F2 (transform of the diagram P vs P), according to evolutive models.
Author (ESA)

N85-22320# Milan Univ. (Italy). Dipt. di Fisica.
PULSARS AND INTERSTELLAR MEDIUM
M. Fracassini (Osservatorio Astronomica, Brera-Merate, Italy), L. E. Pasinetti, and E. Antonello *In* ESA Plasma Astrophys. Nov. 1984 p 319-321 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

A statistical relation between 408 MHz galactic continuum background temperature (T408) and dispersion measure (DM), position, and radio luminosity (L) of 325 pulsars (PSR) was obtained by multiple stepwise regression analysis. This relation shows that PSR may be considered as probes of the galactic places where the observed T408 and the electron density (ne) of the interstellar medium (ISM), derived by large scale models, are correlated. The ne of this relation is that of all the electrons of the ISM which contribute to T408 with thermal and nonthermal emissions. A contribution from the intrinsic luminosity of PSR to T408 cannot be excluded.
Author (ESA)

N85-22321*# California Univ., Berkeley. Dept. of Astronomy.
GALAXY FORMATION
Joseph Silk *In* ESA Plasma Astrophys. Nov. 1984 p 327-340 refs Sponsored by NASA, NSF and US Dept. of Energy (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

Implications of the isotropy of the cosmic microwave background on large and small angular scales for galaxy formation are reviewed. In primeval adiabatic fluctuations, a universe dominated by cold, weakly interacting nonbaryonic matter, e.g., the massive photino is postulated. A possible signature of photino annihilation in our galactic halo involves production of cosmic ray antiprotons. If the density is near its closure value, it is necessary to invoke a biasing mechanism for suppressing galaxy formation throughout most of the universe in order to reconcile the dark matter density with the lower astronomical determinations of the mean cosmological density. A mechanism utilizing the onset of primordial massive star formation to strip gaseous protogalaxies is described. Only the densest, early collapsing systems form luminous galaxies.
Author (ESA)

N85-22322# California Univ., Livermore. Lawrence Livermore Lab.
PROCESSES AND PROBLEMS IN SECONDARY STAR FORMATION
R. I. Klein, R. W. Whitaker (LASL), and M. T. Sandford, II (LASL) Mar. 1984 55 p refs Presented at the 2nd Protostars and Planets Conf., Tucson, Ariz., 4-7 Jan. 1984
(Contract W-7405-eng-48)
(DE85-003623; UCRL-90511; CONF-840183-1) Avail: NTIS HC A04/MF A01

Recent developments relating the conditions in molecular clouds to star formation triggered by a prior stellar generation are reviewed. Primary processes are those that lead to the formation of a first stellar generation. The secondary processes that produce stars in response to effects caused by existing stars are compared and evaluated in terms of the observational data presently available. The role of turbulence in producing clumpy cloud structures is discussed. New work on colliding inter-cloud gas flows leading to non-linear inhomogeneous cloud structures in an intially smooth cloud is introduced. This clumpy morphology has important consequences for secondary formation. The triggering processes of supernovae, stellar winds, and H2 regions are discussed with emphasis on the consequences for radiation driven implosion as a promising secondary star formation mechanism.
DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N85-22323*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY CARTOGRAPHY IN THE NEXT DECADE (1984 - 1994)
1984 71 p refs
(NASA-SP-475; NAS 1.21:475) Avail: NTIS HC A04/MF A01; also available from NASA Information Center, Washington, D.C. 20546 $11.50 (prepaid) CSCL 03A

The cartographic products required to support science and planetary exploration during the next 10 years were assessed. Only major map series or first order maps needed to characterize the surface physiography of a planet or satellite were considered. Included in these considerations are maps needed as bases for plotting geologic, geophysical, and atmospheric phenomena and for planning future planetary exploration. These products consist of three types of maps: controlled photomosaics, shaded relief maps, and topographic contour maps.
E.A.K.

N85-22324*# National Aeronautics and Space Administration, Washington, D. C.
THE INTERNATIONAL VEGA 'VENUS-HALLEY' (1984-1986) EXPERIMENT: DESCRIPTION AND SCIENTIFIC OBJECTIVES
Jan. 1985 85 p Transl. into ENGLISH of "L'experience International VEGA Venus-Halley (1984-1986) Description et Objectifs Scientifiques" Paris, 1984 p 1-81 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by CNES
(Contract NASw-4005)
(NASA-TM-77536; NAS 1.15:77536) Avail: NTIS HC A05/MF A01 CSCL 03B

The Venus-Halley (Vega) project will provide a unique opportunity to combine a mission over Venus with a transfer flight to Halley's comet. This project is based on three research goals: (1) to study the surface of Venus; (2) to study the air circulation on Venus and its meteorological parameters; and (3) to study Halley's comet. The objective of the study of Halley's comet is to: determine the physical characteristics of its nucleus; define the structure and dynamics of the coma around the nucleus; define the gas composition near the nucleus; investigate the dust particle

distribution as a function of mass at various distances from the nucleus; and investigate the solar wind interaction with the atmosphere and ionosphere of the comet. Author

N85-22325# Georgia Univ., Athens.
PHYSIOGRAPHY OF THE MARTIAN WEST EQUATORIAL UPLIFT M.S. Thesis
Neil C. Heywood 1984 166 p refs
Avail: NTIS HC A08/MF A01

The production of a physiographic description of the fractured topography centered over the highest point above the Martian geoid; an area referred to as the West Equatorial Uplift was undertaken. Specific representatives of various landforms and structures were examined and compared to similar features on Earth. A model describing the inferred evolution of the regional landscape is developed which is based on the comparative description. E.A.K.

N85-22326*# Georgia Univ., Athens.
THE ORIGIN AND EVOLUTION OF TERRESTRIAL AND MARTIAN ROCK LABYRINTHS Final Technical Report
George A. Brook [1984] 9 p
(Grant NsG-7539)
(NASA-CR-175511; NAS 1.26:175511) Avail: NTIS HC A02/MF A01 CSCL 03A

The morphological characteristics and evolutionary development of rock labyrinths on Earth (in sandstone, volcanics, and carbonates) are compared with those on Mars. On Earth rock labyrinths originate as parallel, an echelon, or intersecting narrow grabens, or develop where fault and joint networks are selectively eroded. Labyrinths frequently contain both downfaulted and erosional elements. Closed labyrinths contain depressions; open labyrinths do not, they are simple part of a fluvial network generally of low order. As closed labyrinths made up of intersecting grabens or made up of connected erosional depressions are extremely common on Mars, the research focussed on an understanding of these labyrinth types. Field investigations were carried out in Canyonlands National Park, Utah, and in the Chirachahua Mountains of Arizona. Martian labyrinths were investigated using Viking orbiter images. In addition, research was undertaken on apparent thermokarst features in Lunae Planum and Chryse Planitia where closed depressions are numerous and resemble atlas topography. M.G.

N85-22327*# Stanford Univ., Calif. Center for Radar Astronomy.
RADIO SCINTILLATIONS OBSERVED DURING ATMOSPHERIC OCCULTATIONS OF VOYAGER: INTERNAL GRAVITY WAVES AT TITAN AND MAGNETIC FIELD ORIENTATIONS AT JUPITER AND SATURN Ph.D. Thesis
David P. Hinson Nov. 1983 117 p refs Prepared for JPL
(Contract JPL-953618; Grant NGL-05-020-014)
(NASA-CR-175554; NAS 1.26:175554; SU-SR-D208-1983-1) Avail: NTIS HC A06/MF A01 CSCL 03B

The refractive index of planetary atmospheres at microwave frequencies is discussed. Physical models proposed for the refractive irregularities in the ionosphere and neutral atmosphere serve to characterize the atmospheric scattering structures, and are used subsequently to compute theoretical scintillation spectra for comparison with the Voyager occultation measurements. A technique for systematically analyzing and interpreting the signal fluctuations observed during planetary occultations is presented and applied to process the dual-wavelength data from the Voyager radio occultations by Jupiter, Saturn, and Titan. Results concerning the plasma irregularities in the upper ionospheres of Jupiter and Saturn are reported. The measured orientation of the irregularities is used to infer the magnetic field direction at several locations in the ionospheres of these two planets; the occultation measurements conflict with the predictions of Jovian magnetic field models, but generally confirm current models of Saturn's field. Wave parameters, including the vertical fluxes of energy and momentum, are estimated, and the source of the internal gravity waves discovered in Titan's upper atmosphere is considered. A.R.H.

N85-22328*# National Science Foundation, Washington, D.C.
ANTARCTIC METEORITE NEWSLETTER, VOLUME 8, NUMBER 1
Feb. 1985 33 p Sponsored by NASA
(NASA-CR-175587; NAS 1.26:175587) Avail: NTIS HC A03/MF A01 CSCL 03B

Preliminary descriptions and classifications of meteorites examined since the July 1984 newsletter are presented. Each macroscopic description summarizes features that were visible to the eye (with, at most, 50X magnification). Each thin section description represents features that were found in a survey-level examination of a polished thin section that was prepared from a small (usually extrior) chip of the meteorite. Classification is based on microscopic petrography and reconnaissance-level electron-probe microanalyses. M.G.

N85-22329# Bonn Univ. (West Germany). Inst. fuer Physikalische.
A JAMIN INTERFEROMETER TO DETERMINE THE HELIUM ABUNDANCE IN THE ATMOSPHERE OF JUPITER Ph.D. Thesis [EIN JAMIN-INTERFEROMETER ZUR BESTIMMUNG DER HAEUFIGKEIT VON HELIUM IN DER ATMOSPHAERE DES JUPITERS]
Wolfgang Schulte Jul. 1983 73 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie
(BONN-IR-83-17) Avail: NTIS HC A04/MF A01

The gas analysis method used on the Jupiter-helium-interferometer, the calibration of the instrument, and the optical properties of the gases involved in the measurement were studied. A simulation and calibration set up was erected for laboratory tests. The pressure and temperature sensors of the interferometer were calibrated. The time evolution during the descent into the Jupiter atmosphere was for all conditions relevant to the interferometer; during this simulation the behavior of the instrument was determined. Author (ESA)

N85-22275*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTICLE TRANSPORT IN PLANETARY MAGNETOSPHERES
T. J. Birmingham *In* ESA Plasma Astrophys. Nov. 1984 p 49-56 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 06C

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-22330*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
THERMAL STABILITY OF STATIC CORONAL LOOPS: PART 1: EFFECTS OF BOUNDARY CONDITIONS
S. K. Antiochos, E. C. Shoub, C.-H. An (NASA. Marshall Space Flight Center), and A. G. Emslie (Alabama Univ.) Mar. 1985 42 p refs Sponsored in part by NSF
(Grants NGL-05-020-272; NAGw-92; NGR-05-020-668; NsG-7405; Contract N00014-85-I-0111)
(NASA-CR-175495; NAS 1.26:175495; SU-CSSA-ASTRO-85-14)
Avail: NTIS HC A03/MF A01 CSCL 03B

The linear stability of static coronal-loop models undergoing thermal perturbations was investigated. The effect of conditions at the loop base on the stability properties of the models was considered in detail. The question of appropriate boundary conditions at the loop base was considered and it was concluded that the most physical assumptions are that the temperature and density (or pressure) perturbations vanish there. However, if the base is taken to be sufficiently deep in the chromosphere, either several chromospheric scale heights or several coronal loop lengths in depth, then the effect of the boundary conditions on loop stability

becomes negligible so that all physically acceptable conditions are equally appropriate. For example, one could as well assume that the velocity vanishes at the base. The growth rates and eigenmodes of static models in which gravity is neglected and in which the coronal heating is a relatively simple function, either constant per-unit mass or per-unit volume were calculated. It was found that all such models are unstable with a growth rate of the order of the coronal cooling time. The physical implications of these results for the solar corona and transition region are discussed. Author

N85-22331*# Resource Management Associates, Inc., Lafayette, Calif.
DEVELOPMENT OF A GLOBAL 3-D MAGNETOHYDRODYNAMIC COMPUTATIONAL MODEL FOR SOLAR WIND-COMETARY AND PLANETARY STUDIES Quarterly Progress Report
Stephen S. Stahara 15 Mar. 1985 9 p refs
(Contract NASw-4011)
(NASA-CR-175490; NAS 1.26:175490; QPR-1) Avail: NTIS HC A02/MF A01 CSCL 03B

The development of a global, 3-D magnetohydrodynamic computational model is described. This model is used to quantitatively describe the detailed continuum field and plasma interaction process of the solar wind with cometary and planetary magneto/ionopause shapes. The present solar wind/terrestrial planet interaction (Level 1) model (which is based on an axisymmetric gas dynamic plus frozen field approximation to the full MHD equations) is extended to a full 3-D gas dynamic (Level 2) approximation. A mass loading capability in the Level 1 interaction model is implemented. B.W.

N85-22332# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 2: (COMPREHENSIVE REPORTS)
Helen E. Coffey, ed. Aug. 1984 100 p 2 Vol.
(PB85-112076; LC-79-640375; SGD-480; ISSN-0038-0911) Avail: NTIS HC A05/MF A01 CSCL 03B

A detailed index of solar data 1983/1984 is presented, data for February 1984--(solar radio bursts at fixed frequencies, solar X-ray radiation from GOES satellite, mass ejections from the Sun, active prominences and filaments); data for September 1981--solar flares September 1981; and miscellaneous data--number of flares August 1966 - September 1981. GRA

N85-22333*# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 479, JULY 1984. PART 1: (PROMPT REPORTS). DATA FOR JUNE 1984, MAY 1984 AND LATER DATA
H. E. Coffey, ed. Jul. 1984 132 p refs
(NASA Order 15519; Grant NSF ATM-83-1491)
(NASA-CR-175542; NAS 1.26:175542; PB85-115772; SGD-479-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 03B

Solar and geophysical data for May and June 1984 are reported. Topics include: detailed index for 1983/1984; data for June 1984 (solar activity indices, solar flares, solar radio emission, mean solar magnetic field, boulder geomagnetic substorm log); data for May 1984 (solar active regions, sudden ionospheric disturbances, solar radio spectral observations, cosmic ray measurements by neutron monitor, geomagnetic indices, radio propagation indices); and late data (geomagnetic indices March and April 1984 sudden commencements/solar flare effects, cosmic ray measurements by neutron monitor, and solar active regions). GRA

N85-22334*# National Oceanic and Atmospheric Administration, Rockville, Md. Air Resources Lab.
NIMBUS-7 SBUV (SOLAR BACKSCATTER ULTRAVIOLET) OBSERVATIONS OF SOLAR UV SPECTRAL IRRADIANCE VARIATIONS CAUSED BY SOLAR ROTATION AND ACTIVE-REGION EVOLUTION FOR THE PERIOD NOVEMBER 7, 1978 - NOVEMBER 1, 1980
Donald F. Heath, Thomas P. Repoff, and Richard F. Donnelly Sep. 1984 78 p refs Sponsored in part by NASA
(NASA-CR-175544; NAS 1.26:175544; PB85-128452; NOAA-TM-ERL-ARL-129) Avail: NTIS HC A05/MF A01 CSCL 03B

Observations of temporal variations of the solar UV spectral irradiance over several days to a few weeks in the 160-400 nm wavelength range are presented. Larger 28-day variations and a second episode of 13-day variations occurred during the second year of measurements. The thirteen day periodicity is not a harmonic of the 28-day periodicity. The 13-day periodicity dominates certain episodes of solar activity while others are dominated by 28-day periods accompanied by a week 14-day harmonic. Techniques for removing noise and long-term trends are described. Time series analysis results are presented for the Si II lines near 182 nm, the Al I continuum in the 190 nm to 205 nm range, the Mg I continuum in the 210 nm to 250 nm range, the MgII H & K lines at 280 nm, the Mg I line at 285 nm, and the Ca II K & H lines at 393 and 397 nm. GRA

N85-22335# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 483. NOVEMBER 1984. PART 1: (PROMPT REPORTS). DATA FOR OCTOBER 1984, SEPTEMBER 1984 AND LATE DATA
H. E. Coffey Nov. 1984 99 p 2 Vol.
(PB85-147692; SGD-483-Pt-1; LC-79-640375-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 03B

A detailed index of solar-geophysical data for 1984 is presented. Specifically, the index includes: data for October 1984--(IUWDS alert periods (adanced and worldwide); solar activity indices; solar flares; solar radio emission; inferred interplanetary magnetic field polarity graph; mean solar magnetic field); data for September 1984--(solar active regions; sudden ionospheric disturbances; solar radio spectral observations; cosmic ray measurements by neutron monitor; geomagnetic indices; radio propagation indices); late ata--(Culgoora solar radio spectral data August 1984, geomagnetic sudden commencements August 1984, cosmic rays Deep River/ alert July and August 1984, Big Bear calcium plage daily photos/ calcium plage index April-May 1983, Vostok corrected inferred interplanetary magnetc field polarity. GRA

N85-22336# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 483, NOVEMBER 1984. PART 2: (COMPREHENSIVE REPORTS). DATA FOR MAY 1984, DECEMBER 1981 AND MISCELLANEA
H. E. Coffey Nov. 1984 112 p 2 Vol.
(PB85-147700; SGD-483-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 03B

Solar data for 1984 are presented including: data for May 1984--(meudon carte synoptique; solar radio bursts at fixed frequencies; interplanetary solar particles and plasma; solar X-ray radiation from GOES satellite; mass ejections from the sun; active prominences and filaments); Data for December 1981--(solar flares December 1981; number of flares August 1966-December 1981); miscellaneous data--solar wind (IMP 8) October 1983 to April 1984. GRA

N85-22231*# San Juan Coll., Farmington, N. Mex.
THE MODELLING OF LATITUDINAL GRADIENTS IN THE SOLAR WIND IN THE OUTER SOLAR SYSTEM
Steven Nerney *In* Alabama Univ. Res. Rept.: 1984 NASA/ASEE Summer Faculty Fellowship Program (NASA-CR-171317) Jan. 1985 22p refs (For primary document see N85-22210 12-80) Avail: NTIS HC A99/MF E03 CSCL 03B

N85-22272*# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.
DISCOVERY OF THE SOLAR WIND
B. Rossi *In* ESA Plasma Astrophys. Nov. 1984 p 27-32 refs (For primary document see N85-22270 12-90)
(Grant NGL-22-009-015)
Avail: NTIS HC A15/MF A01 CSCL 03B

N85-22273# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
VELOCITY DISTRIBUTIONS OF SOLAR WIND IONS AND ELECTRONS
E. Marsch *In* ESA Plasma Astrophys. Nov. 1984 p 33-40 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22276# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
ACTIVATION OF SOLAR FLARES
P. J. Cargill, S. Migliuolo, and A. W. Hood (Napier Coll.) *In* ESA Plasma Astrophys. Nov. 1984 p 57-63 refs Sponsored by NSF (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22277# Academy of Sciences (USSR), Leningrad. Technical Inst. of Physics.
PLASMA AND NUCLEAR PROCESSES IN SOLAR MATTER
G. E. Kocharov *In* ESA Plasma Astrophys. Nov. 1984 p 65-81 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22291# Toyama Univ. (Japan). Dept. of Applied Mathematics and Physics.
FORCED RECOGNITION BY NONLINEAR MHD WAVES AND SEQUENTIAL TRIGGERING OF SOLAR FLARES
J. Sakai, T. Tajima (Texas Univ., Austin), and F. Brunel (Texas Univ., Austin) *In* ESA Plasma Astrophys. Nov. 1984 p 185-187 refs (For primary document see N85-22270 12-90)
(Grant NSF ATM-82-14730; Contract DE-FG05-80ET-53088)
Avail: NTIS HC A15/MF A01

N85-22293*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIGNATURES OF THE COALESCENCE INSTABILITY IN SOLAR FLARES
H. Nakajima, T. Tajima (Texas Univ., Austin), F. Brunel (Texas Univ.), and J. Sakai (Toyama Univ., Japan) *In* ESA Plasma Astrophys. Nov. 1984 p 193-196 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 03B

N85-22310*# Turin Univ. (Italy).
EQUILIBRIUM MODEL OF THIN MAGNETIC FLUX TUBES
G. Bodo (Osservatorio Astronomica di Torino), A. Ferrari, S. Massaglia, W. Kalkofen (Harvard-Smithsonian Center for Astrophysics), and R. Rosner (Harvard-Smithsonian Center for Astrophysics) *In* ESA Plasma Astrophys. Nov. 1984 p 277-280 refs Sponsored by Italian Ministero della Pubblica Istruzione (For primary document see N85-22270 12-90)
(Grants NAGw-79; NAGw-253; NSF AST-83-03522; CNR-PSN-83-035)
Avail: NTIS HC A15/MF A01 CSCL 03B

N85-22314# Milan Univ. (Italy). Dipt. di Fisica.
THE INFLUENCE OF THE LOCAL SOLAR WIND STRUCTURES ON THE PROPAGATION OF LOW ENERGY PARTICLES
M. Amati and C. Paizis *In* ESA Plasma Astrophys. Nov. 1984 p 293-296 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-22337*# California Inst. of Tech., Pasadena. Space Radiation Lab.
RESEARCH IN PARTICLES AND FIELDS Semiannual Status Report, 1 Apr. - 30 Sep. 1984
E. C. Stone, L. Davis, Jr., R. A. Mewaldt, and T. A. Prince 1984 14 p refs
(Grant NGR-05-002-160)
(NASA-CR-175472; NAS 1.26:175472) Avail: NTIS HC A02/MF A01 CSCL 03B

The astrophysical aspects of cosmic rays and gamma rays and of the electromagnetic field environment of the Earth and other planets are investigated. These investigations are carried out by means of energetic particle and photon detector systems flown on spacecraft and balloons. B.W.

N85-22278*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRON AND GAMMA-RAY SIGNATURES FOR PARTICLE ACCELERATION IN SOLAR FLARES
R. Ramatay and R. J. Murphy (Maryland Univ., College Park) *In* ESA Plasma Astrophys. Nov. 1984 p 83-90 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01 CSCL 03B

N85-22286# Academy of Sciences (USSR), Moscow. Inst. of General Physics.
COSMIC RAY GENERATION BY PLASMA TURBULENCE: DEVELOPMENT OF A NEW PARADIGM IN PHYSICS
V. N. Tsytovich *In* ESA Plasma Astrophys. Nov. 1984 p 141-152 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22287# Central Research Inst. for Physics, Budapest (Hungary).
COSMIC RAY COMPOSITION AND ORIGIN
P. Kiraly *In* ESA Plasma Astrophys. Nov. 1984 p 153-157 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

N85-22290# Max-Planck-Inst. fuer Kernphysik, Heidelberg (West Germany).
SELF-SIMILAR MODIFIED SHOCK STRUCTURES
R. Beck and L. OCDrury *In* ESA Plasma Astrophys. Nov. 1984 p 181-184 refs (For primary document see N85-22270 12-90)
Avail: NTIS HC A15/MF A01

99 GENERAL

N85-22338* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
1985 RESIDENT RESEARCH ASSOCIATESHIPS: POSTDOCTORAL AND SENIOR RESEARCH AWARDS
1985 68 p
(NASA-TM-87458; NAS 1.15:87458) Avail: Issuing Activity CSCL 05A

The National Research Council conducts the Resident Associateship Programs in cooperation with a number of sponsoring federal laboratories and research organizations approved by the Research Council for participation. In the programs, a national competition is conducted by the Research Council to recommend and make awards to outstanding scientists and engineers at the recent postdoctoral and experienced senior levels for tenure as guest investigators at the participating laboratories. These programs have been conducted with a number of federal agencies since 1954. The objectives of the program are discussed. Eligibility requirements, award conditions, and application procedures are also discussed. B.W.

N85-22339*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
CHRONOLOGY OF KSC AND KSC RELATED EVENTS FOR 1983
Ken Nail, Jr., comp. 1 Oct. 1984 120 p
(NASA-TM-87435; NAS 1.15:87435; KHR-8) Avail: NTIS HC A06/MF A01

A record of Kennedy Space Center (KSC) events and a reference source for historians and other researchers was assembled. Arrangement is by month; items are by date of the published sources. Actual date of the event may be indicated in parenthesis, when the article iteself does not make that information explicit. G.L.C.

N85-22340*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESEARCH AND TECHNOLOGY: FISCAL YEAR 1984 REPORT
[1985] 116 p refs
(NASA-TM-85231; NAS 1.15:85231) Avail: NTIS HC A06/MF A01

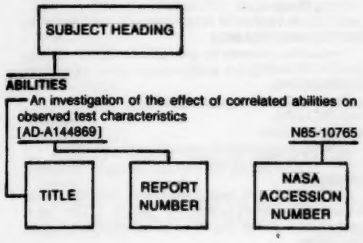
Topics covered include extraterrestrial physics, high energy astrophysics, astronomy, solar physics, atmospheres, oceans, terrestrial physics, space technology, sensors, techniques, user space data systems, space communications and navigation, and system and software engineering. B.G.

N85-22341# Committee on Science and Technology (U. S. House).
SUMMARY OF ACTIVITIES OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY
Washington GPO 1985 178 p Rept. presented by the comm. on Sci. and Technol., 98th Congr., 2nd Sess., 2 Jan. 1985
(H-Rept-98-1189; GPO-51-006) Avail: US Capitol, House Document Room

The Committee on Science and Technology is responsible for annual authorizations for the National Aeronautics and Space Administration programs. Public Law 98-52 authorizes $7,267,600,000 to be appropriated to the National Aeronautics and Space Administration for FY 1984. The authorization included $5,883,000,000 for research and development programs under the following new items: Space transportation capability development; Space transportation operations; Physics and astronomy; Planetary exploration; Life sciences; Space applications; Technology utilization; Aeronautical research and technology; Space research and technology; and Tracking and data systems. The authorization bill included $142,100,000 for Construction of Facilities. For Research and Program Management, the bill authorizes $1,242,500,000 and such additional amounts as may be necessary for increases in salary, pay, retirement, or other employee benefits authorized by law. G.L.C.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

A

ABRASION RESISTANCE
Effects of B, Ti and Ta implantation on the wear resistance of Fe and Ni-plated Fe
[AD-A149947] N85-21330
ABSORPTION COOLING
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010813] N85-21798
ABSORPTION CROSS SECTIONS
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849
ABSORPTION SPECTRA
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150
ABSORPTION SPECTROSCOPY
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
ABSORPTIVITY
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique
[AD-D011548] N85-21281
ABSTRACTS
Model of information-reference dialogue system for working with document abstracts N85-21949
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 267, January 1985
[NASA-SP-7011(267)] N85-21959
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260
ABUNDANCE
Cosmic ray composition and origin N85-22287
A Jamin interferometer to determine the helium abundance in the atmosphere of Jupiter
[BONN-IR-83-17] N85-22329
ACCELERATED LIFE TESTS
A note on some simple influence diagnostics in accelerated life testing
[AD-A149593] N85-21677
ACCELERATORS
Superconducting magnet technology for accelerators
[DE85-004192] N85-22102
ACCIDENTS
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962
ACCRETION DISKS
Thermal convection and magnetic fields in accretion disks of black holes N85-22285
Drift-accretion theory of the spiral structure of galaxies N85-22298
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
Formation of optical-line emitting regions in the jets of SS433 N85-22318
ACCURACY
Model control of structural systems
[AD-A149734] N85-21235
Speed and accuracy in automated manufacture
[DE85-003913] N85-21410
Accuracy of typhoon center determined by GMS imagery N85-21887
AFOS (Automation of Field Operations and Services)-ERA forecast verification, September 1984
[PB85-137578] N85-21912
ACETYLENE
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
ACID RAIN
Effects of air pollution and acid rain on forest decline
[GPO-37-459] N85-21818
Report on the Second Annual Review Meeting of the National Acid Precipitation Assessment Program. Research to assist decisionmaking: Summary
[DE85-003003] N85-21820
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21829
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
ACOUSTIC ATTENUATION
The role of dislocations in ultrasonic attenuation
[AERE-R-11384] N85-21317
Surface forward scattering and reflection
[AD-A150115] N85-22112
ACOUSTIC EMISSION
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11289] N85-21721
Method and apparatus for detecting acoustic emissions from metal matrix wire
[AD-D011556] N85-22107
ACOUSTIC EXCITATION
Preliminary analysis of tone-excited two-stream jet velocity decay
[NASA-TM-86951] N85-21114
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
ACOUSTIC INSTABILITY
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
ACOUSTIC LEVITATION
Development of the sonic pump levitator
[NASA-CR-171382] N85-21186
High temperature acoustic levitator
[NASA-CASE-NPO-16022-1] N85-22105
ACOUSTIC MEASUREMENT
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
Calibration method for acoustic scattering measurements using a spherical target
[AD-D011521] N85-22106
ACOUSTIC MICROSCOPES
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
ACOUSTIC PROPAGATION
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel
[AD-A149596] N85-22110
ACOUSTIC PROPERTIES
Acoustic scaling: A re-evaluation of the acoustic model of Manchester Studio 7
[BBC-RD-1984/18] N85-21432
ACOUSTIC SCATTERING
Calibration method for acoustic scattering measurements using a spherical target
[AD-D011521] N85-22106
Surface forward scattering and reflection
[AD-A150115] N85-22112
ACOUSTIC SOUNDING
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21260
ACOUSTIC VELOCITY
Sound velocity of carbon at high pressures
[DE85-002016] N85-22113
ACOUSTICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-85-004] N85-21531
Methods of progressing waves in turbulent media with applications to acoustics
[AD-A149599] N85-22055
ACOUSTO-OPTICS
Photoacoustic effect and its applications N85-21421
ACTUATION
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
ACTUATORS
Solar powered actuator with continuously variable auxiliary power control
[NASA-CASE-MFS-25637-1] N85-21759
ADA (PROGRAMMING LANGUAGE)
A Gypsy-to-Ada program compiler
[TR-39] N85-22005
A proposal for standard basic functions in Ada
[CWI-NM-R8407] N85-22036
Selection and use of general-purpose programming-language: Program examples, volume 2
[PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1
[PB85-122018] N85-22040

ADAPTATION
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
ADAPTIVE CONTROL
Adaptive regulation of transmitter radiation power in radio lines during delays of control signals N85-21551
ADDITIVES
Characterization of lubricated bearing surfaces operated under high loads
[NASA-TM-86964] N85-21357
Plasmachemical evaporation and doping of amorphous silicon N85-21790
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
ADDRESSING
Automatic multi-banking of memory for microprocessors
[NASA-CASE-NPO-15295-1] N85-21992
ADHESION
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359
ADHESIVE BONDING
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends
[NASA-TM-86355] N85-21270
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
ADHESIVES
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft
[NASA-CASE-LAR-12775-2] N85-21349
Rubber modified epoxy adhesive
[AD-D011527] N85-21354
ADRENAL GLAND
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944
ADRENOCORTICOTROPIN (ACTH)
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935
ADSORPTION
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
AERIAL RUDDERS
Translating rudder pedal system
[AD-D011510] N85-21172
AEROBRAKING
Design study of an integrated aerobraking orbital transfer vehicle
[NASA-TM-58264] N85-21262
AERODYNAMIC BALANCE
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats
[DE85-000529] N85-21805
AERODYNAMIC CHARACTERISTICS
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454
AERODYNAMIC COEFFICIENTS
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110
Flight-measured laminar boundary-layer transition phenomena including stability theory analysis
[NASA-TP-2417] N85-21118
AERODYNAMIC CONFIGURATIONS
Semianalytic modeling of aerodynamic shapes
[NASA-TP-2413] N85-21120
AERODYNAMIC DRAG
Techniques to analyze vehicle coastdown data
[DE85-006150] N85-21127
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157
AERODYNAMIC LOADS
Calculation of the flow around thick wings with separation vortices N85-21424
AERODYNAMIC NOISE
Noise transmission loss of a rectangular plate in an infinite baffle
[NASA-TP-2398] N85-22109
AERODYNAMICS
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
An investigation of aerowindows for solar receivers
[DE84-010931] N85-21772
List of RAE (Royal Aircraft Establishment) translations issued during the period 1 March 1983 - 31 March 1984
[AD-A149787] N85-22257
AEROELASTICITY
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
AERONAUTICAL ENGINEERING
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
Bibliography of Lewis Research Center technical publications announced in 1983
[NASA-TM-83693] N85-22255
List of RAE (Royal Aircraft Establishment) translations issued during the period 1 March 1983 - 31 March 1984
[AD-A149787] N85-22257
AERONOMY
Sounding rocket program Aeronomie. The payload M-I in the project MAP-WINE
[BMFT-FB-W-84-046] N85-21238
AEROSOLS
Novel photo-thermal technique for flow and spectroscopic measurements in a dense aerosol stream
[AD-A149745] N85-21287
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor
[AD-A150111] N85-21295
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
Study of electric field and ion effects on HVDC lines
[DE85-002975] N85-21503
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21638
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths
[NASA-TM-86379] N85-21874
Impact of aerosols on visibility and climate: A report prepared for Panel 3, Environmental Impact, of the NATO/CCMS Air Pollution Pilot Study on Air Pollution Control Strategies and Impact Modelling
[PB85-106744] N85-21906
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966
AEROSPACE ENGINEERING
Bibliography of Lewis Research Center technical publications announced in 1983
[NASA-TM-83693] N85-22255
AEROSPACE ENVIRONMENTS
Assessment of satellite collision hazards by simulated sampling in space N85-21195
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Natural environment design criteria for the Space Station definition and preliminary design
[NASA-TM-86498] N85-21232
On the P1 data from GMS-SEM N85-21890
AEROSPACE MEDICINE
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
Review of US manual of clinical aviation medicine N85-21957
Review of US guide on medication and flying N85-21958
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 267, January 1985
[NASA-SP-7011(267)] N85-21959
Second generation USAFSAM (United States Air Force School of Aerospace Medicine) microprocessor audiometer
[AD-A149938] N85-21963
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
AEROTHERMODYNAMICS
Combustion research for gas turbine engines
[NASA-TM-86963] N85-21164
AFTERBURNING
Flameholder with integrated air mixer
[AD-D011549] N85-21161
AGGLOMERATION
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
AGGREGATES
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves
[AERE-R11483] N85-22203
AGING (BIOLOGY)
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
AGING (MATERIALS)
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
NBS solar collector durability/reliability test program
[DE85-003489] N85-21801
AGRISTARS PROJECT
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
Estimating solar radiation for plant simulation models
[E85-10089] N85-21751
AIR
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor
[DE85-003663] N85-21337
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577
AIR BREATHING ENGINES
An air-breathing ballistic space transporter for Europe
[NASA-TM-77645] N85-21244
AIR CONDITIONING
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010813] N85-21798
AIR COOLING
Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
AIR FLOW
Flameholder with integrated air mixer
[AD-D011549] N85-21161
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573
Multi-year plan for Experimental Systems Research: Passive and hybrid solar energy program
[DE85-004698] N85-21810
AIR JETS
Improved silicon grinding method and apparatus
[NASA-CASE-NPO-16336-1-CU] N85-21407
AIR POLLUTION
Effects of air pollution and acid rain on forest decline
[GPO-37-459] N85-21818
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE)
[PB85-128460] N85-21839
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
Hazardous air pollutants: Dry-deposition phenomena
[PB85-138279] N85-21843

Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena
[PB85-137370] N85-21844
Sector analysis of relevant meteorological parameters for long range transport of air pollutants
[NR-27] N85-21882
Impact of aerosols on visibility and climate: A report prepared for Panel 3, Environmental Impact, of the NATO/CCMS Air Pollution Pilot Study on Air Pollution Control Strategies and Impact Modelling
[PB85-106744] N85-21906

AIR QUALITY
Legislation to improve airline safety
[GPO-38-222] N85-21132
Evaluation of complex terrain air quality simulation models
[PB85-119485] N85-21835
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
Air quality criteria for ozone and other photochemical oxidants, external review draft, volume 3
[PB85-126050] N85-21837
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838

AIR SAMPLING
Evaluation of complex terrain air quality simulation models
[PB85-119485] N85-21835
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE)
[PB85-128460] N85-21839

AIR SEA ICE INTERACTIONS
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916

AIR TO AIR REFUELING
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157

AIR TRAFFIC
Ultralight aircraft technology and public safety
[GPO-38-948] N85-21131

AIR TRAFFIC CONTROL
Collision avoidance for Naval training aircraft
[FAA/PM-84-4] N85-21136
The evolution of methods of air traffic control
[AD-A149606] N85-21137
Operations concept for the advanced automation system man-machine interface
[AD-A149797] N85-21139
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467

AIR TRAFFIC CONTROLLERS (PERSONNEL)
Operations concept for the advanced automation system man-machine interface
[AD-A149797] N85-21139

AIR WATER INTERACTIONS
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline
[AD-A149957] N85-21857
Intensification of tropical instabilities
[AD-A149985] N85-21899
Oceanic role in terrestrial climate
[DE85-004422] N85-21904

AIRBORNE EQUIPMENT
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449

AIRCRAFT ACCIDENT INVESTIGATION
Proceedings of the 6th Human Factors Workshop on Aviation
[AD-A150043] N85-21982

AIRCRAFT ACCIDENTS
Annual review of aircraft accident data: US air carrier operations calendar year 1981
[NTSB/ARC-85/01] N85-21134

AIRCRAFT ANTENNAS
Proceedings of the Symposium on Electromagnetic Windows (17th) held at Georgia Inst. of Technology, Engineering Experiment Station, Atlanta, Georgia on 25-27 July 1984. Part 2
[AD-A149125] N85-21444
Comparison of spherical wave ray tracing and exact boundary value solutions for spherical radomes
[AD-P004353] N85-21447

AIRCRAFT CARRIERS
An interactive environment for the development of an expert system in ZOG
[AD-A149954] N85-22025

AIRCRAFT COMPARTMENTS
Legislation to improve airline safety
[GPO-38-222] N85-21132
Suppression and control of Class C cargo compartment fires
[FAA/CT-84-21] N85-21133
Simultaneous cabin and ambient ozone measurements on two Boeing 747 airplanes. Volume 3: October 1978 - July 1979
[NASA-TM-86883] N85-21872

AIRCRAFT CONSTRUCTION MATERIALS
Composite structural materials
[NASA-CR-175515] N85-21268

AIRCRAFT CONTROL
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176

AIRCRAFT DESIGN
Current development, applications of airships in USSR N85-21109
Towards a renewal of the propeller in aeronautics
[NASA-TM-77803] N85-21169
Translating rudder pedal system
[AD-D011510] N85-21172
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175
Lubrication and performance of high-speed rolling-element bearings
[NASA-TM-86958] N85-21658
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970

AIRCRAFT ENGINES
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3878] N85-21117
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122
Stratified charge rotary aircraft engine technology enablement program
[NASA-CR-174812] N85-21163
Tribological systems as applied to aircraft engines
[NASA-TM-86965] N85-21657

AIRCRAFT EQUIPMENT
Laser clock
[AD-D011513] N85-21634

AIRCRAFT FUEL SYSTEMS
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products
[AD-A149777] N85-21368

AIRCRAFT FUELS
A study of intumescent reaction mechanisms
[AD-A149605] N85-21365

AIRCRAFT GUIDANCE
Algorithms for automatic four-dimensional aircraft guidance, considering the momentary wind situation
[DFVLR-FB-84-40] N85-21146
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176

AIRCRAFT HAZARDS
Annual review of aircraft accident data: US air carrier operations calendar year 1981
[NTSB/ARC-85/01] N85-21134
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982
[NASA-TM-86347] N85-21877
Wind shear detection technology
[GPO-38-920] N85-21879

AIRCRAFT LANDING
New runway enables IL-76 flights to Tenkeli in far north N85-21108
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179

AIRCRAFT MAINTENANCE
Transportation
[JPRS-UTR-85-004] N85-21105
Aviation repair plant directors on quality control measures N85-21106
Proceedings of the 6th Human Factors Workshop on Aviation
[AD-A150043] N85-21982

AIRCRAFT MODELS
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110

AIRCRAFT SAFETY
Legislation to improve airline safety
[GPO-38-222] N85-21132
Annual review of aircraft accident data: US air carrier operations calendar year 1981
[NTSB/ARC-85/01] N85-21134
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
Wind shear detection technology
[GPO-38-920] N85-21879
FTASUM: Aviation forecast summaries
[PB85-112977] N85-21908

AIRCRAFT SPIN
Extended moment arm anti-spin device
[NASA-CASE-LAR-12979-1] N85-21147

AIRCRAFT STABILITY
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149

AIRCRAFT STRUCTURES
Integrated paratroop door
[AD-D011507] N85-21148
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
A history of full-scale testing of aircraft structures at the National Aeronautical Establishment
[NAE-AN-24] N85-21153
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft
[NASA-CASE-LAR-12775-2] N85-21349
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676

AIRFOIL PROFILES
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125

AIRFOILS
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
Tailored airfoils for vertical axis wind turbines
[DE85-004628] N85-21128
Numerical integration of the unsteady full-potential equation with applications to transonic flow about a two-dimensional airfoil
[NLR-MP-84022-U] N85-21130

AIRPORTS
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting
[DE85-002503] N85-21185
FTASUM: Aviation forecast summaries
[PB85-112977] N85-21908

AIRSHIPS
Current development, applications of airships in USSR N85-21109

AIRY FUNCTION
Brownian motion with a parabolic drift and Airy functions
[CWI-MS-R8413] N85-22097

ALBEDO
Atlas of relectance patterns for uniform earth and cloud surfaces (NIMBUS-7ERB-61 days)
[PB85-116382] N85-21870
GMS operational calibration procedure and status N85-21893

ALCOHOLS
Fluorinated polyurethanes
[AD-D011526] N85-21353

ALDOSTERONE
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935

ALGEBRA
Parallel linear algebra library for the Denelcor HEP
[DE85-004685] N85-22034

ALGORITHMS
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
Algorithms for automatic four-dimensional aircraft guidance, considering the momentary wind situation
[DFVLR-FB-84-40] N85-21146
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
[NASA-TM-83590] N85-21162
Modal control of structural systems
[AD-A149734] N85-21035
Estimating algorithmic error of digital recursive filters N85-21543

Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
Synthesis of digital control for object with lag N85-21562
Mathematical simulation of thermal processes involved in electron-beam treatment N85-21565
Modeling of transient heat pipe operation [NASA-CR-175496] N85-21571
A three-dimensional spectral algorithm for simulations of transition and turbulence [NASA-CR-172561] N85-21575
Algorithm for the simulation of transient viscoelastic flows with free surfaces [DE85-002713] N85-21590
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm [NLR-MP-84003-U] N85-21593
Velocity inversion using a stratified reference [AD-A150082] N85-21858
RAPIDbus: Design of an extensible multiprocessor structure [AD-A150061] N85-21998
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh [LA-10092-T] N85-22006
User's guide for NPSOL (Version 2.1): A FORTRAN package for quadratic programming [AD-A150078] N85-22026
Software for special functions [DE85-004684] N85-22033
Parallel linear algebra library for the Denelcor HEP [DE85-004685] N85-22034
Determining conductivity by boundary measurements. Part 2: Interior results [AD-A149750] N85-22063
Parallel processing of encoded bit strings [AD-A149612] N85-22064
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision [AD-A149997] N85-22068
Statistics for the maximum of several positive random variables with application to networking [AD-A150005] N85-22069
A review of some aspects of robust inference for time series [AD-A149706] N85-22082
Needs, opportunities, and options for large scale systems research [DE85-004642] N85-22091
Determining object orientation from a single image using multiple information sources [AD-A149980] N85-22146
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape [AD-A149981] N85-22147
Evaluation of expert systems N85-22229
Problems in decentralized decision making and computation [AD-A150025] N85-22251

ALIGNMENT
Ingot slicing machine and method [NASA-CASE-NPO-15483-1] N85-21650

ALIPHATIC COMPOUNDS
Fluorinated polyurethanes [AD-D011526] N85-21353

ALKALI METALS
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals [AD-A149760] N85-21290

ALKALINE BATTERIES
Research on separators for alkaline zinc batteries [DE85-003082] N85-21523

ALKALINITY
Carbonate chemistry of the Weddell Sea [DOE/EV-110611/4] N85-21916

ALLOCATIONS
Summary of activities of the Committee on Science and Technology [H-REPT-98-1189] N85-22341

ALLOYS
Alloys based on NiAl for high temperature applications [NASA-TM-86976] N85-21322
Advanced thin film thermocouples [NASA-CR-175541] N85-21607
Viscoplastic constitutive relationships with dependence on thermomechanical history [NASA-CR-174836] N85-21691

ALTERNATIVES
Diesel fuel alternatives for engines in civil works prime movers [AD-A149738] N85-21400

ALTIMETERS
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays [PB85-129641] N85-21767

ALTITUDE
Atmospheric environment for Space Shuttle (STS-51A) launch [NASA-TM-86497] N85-21675

ALTITUDE ACCLIMATIZATION
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947

ALUMINATES
Alloys based on NiAl for high temperature applications [NASA-TM-86976] N85-21322

ALUMINUM
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27 [NASA-TP-2443] N85-21323

ALUMINUM ALLOYS
Carbon filter plates for aluminum filtration at casting [BMFT-FB-T-84-242] N85-21343
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C [DE85-000810] N85-21624
Defect characterisation and monitoring by acoustic emission [AERE-R-11409] N85-21683
Characterisation of fatigue crack extension by quantitative acoustic emission [AERE-R-11289] N85-21721
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224

ALUMINUM CHLORIDES
Electrochemistry and electrochemical methodology in molten salts [AD-A149613] N85-21284

ALUMINUM OXIDES
Electrochemical processes at the sodium (BETA)" alumina interface [DE85-004653] N85-21305
The Valence- and conduction-band structure of the sapphire (1102) surface [AD-A150001] N85-22184

AMBIENCE
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220

AMBIGUITY
The ambiguity function and the Wigner distribution [AD-A150095] N85-21482

AMINES
Metal (11) 4,4',4',4"-phthalocyanine tetraamines as curing agents for epoxy resins [NASA-CASE-ARC-11424-1] N85-21361
Amine salts as bonding agents [AD-D011543] N85-21396

AMINO ACIDS
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984 [JPRS-USB-85-002] N85-21931
Cosmonauts' blood plasma free amino acid levels during preflight training N85-21937

AMMONIA
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948

AMORPHOUS SEMICONDUCTORS
International Congress Centrum Berlin report on photovoltaics N85-21773
Pin solar cells made of amorphous silicon N85-21787
Development of an amorphous silicon panel N85-21788
Amorphous silicon solar cells with a view to cheap production processes N85-21789
Plasmachemical evaporation and doping of amorphous silicon N85-21790
Production and characterization of amorphous silicon (a-Si:H) as base material for solar cells N85-21791
Thin-film solar cells from sputtered and vapor-deposited amorphous silicon N85-21792

AMPLIFICATION
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study [AD-A150059] N85-21645

AMPLIFIERS
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths [DE85-000862] N85-21648

AMPLITUDES
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study [AD-A150059] N85-21645
Surface forward scattering and reflection [AD-A150115] N85-22112

AMPOULES
Reusable thermal cycling clamp [NASA-CASE-LAR-12868-1] N85-21651

ANALOG DATA
Electrical characterization of analog microprocessors [AD-A149629] N85-21995

ANALOG SIMULATION
Estimating algorithmic error of digital recursive filters N85-21543

ANALOG TO DIGITAL CONVERTERS
The study of certain aspects of probability with applications in communications theory [AD-A149820] N85-21476
Multichannel digital processing of wideband signals N85-21548
EZPIX: A tablet entry method for computer-generated slides, drawings, and graphs [DE85-005234] N85-22030

ANALYTICAL CHEMISTRY
Two-dimensional measurements of OH concentration and temperature in reactive flows [AD-A149849] N85-21292

ANECHOIC CHAMBERS
Near-field effects on radome boresight errors [AD-P004356] N85-21450

ANEMOMETERS
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly [DE85-003260] N85-21592

ANGLES (GEOMETRY)
Detection of angular modulated electromagnetic signals [AD-D011563] N85-21437

ANGULAR MOMENTUM
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608

ANIONS
The synthesis, structural characterization and reactions of closo-Rhodacarborane Anions containing a formal d8 metal vertex 1,2 [AD-A149640] N85-21285

ANISOTROPY
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation [AD-A150105] N85-21859

ANNEALING
Low cost, sprayed CuInSe2 solar cell research [DE85-003467] N85-21799
Investigation of device and electronic interactions in GaAs device processing [AD-A149747] N85-22182

ANNUAL VARIATIONS
OSCAR experiment high-density network data report [DE85-004907] N85-21826
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline [AD-A149957] N85-21857
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data [NASA-CR-175542] N85-22333

ANODES
Alternative anodic reactions in water splitting [DE85-004159] N85-21300
Review of anode phenomena in vacuum arcs [DE85-002736] N85-22101

ANODIC STRIPPING
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water [DE85-002781] N85-21619

ANOMALIES
Workshop on Remote Sensing/Lineament Applications for Energy Extraction [DE84-009291] N85-21763

ANTARCTIC REGIONS
Los Alamos MINI-Review: Tracking Antarctic winds [DE85-004597] N85-21903

ANTENNA ARRAYS
Multiple loop sidelobe canceller [AD-D011533] N85-21434
Method and apparatus for self-calibration and phasing of array antenna [NASA-CASE-NPO-15920-1] N85-21493

Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
Phased antenna array for wind profiling applications
[PB85-132884] N85-21529
ANTENNA COMPONENTS
The 60 GHz antenna system analyses for intersatellite links, phase A
[NASA-CR-175285] N85-21439
Deployable folded antenna apparatus
[AD-D011503] N85-21495
ANTENNA DESIGN
The 60 GHz antenna system analyses for intersatellite links, phase A
[NASA-CR-175285] N85-21439
Image lobe analysis for large radomes
[AD-P004359] N85-21453
3-D Dome/Rotman lens antenna breadboard demonstration
[AD-A149809] N85-21475
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
Performance ranges of helical antenna made of conductor with extra bends N85-21536
ANTENNA FEEDS
Printed circuit balun with a dipole antenna
[AD-D011534] N85-21498
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
ANTENNA RADIATION PATTERNS
Landing control centrals
[AD-A149800] N85-21140
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157
The 60 GHz antenna system analyses for intersatellite links, phase A
[NASA-CR-175285] N85-21439
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449
Automated radome testing
[AD-P004362] N85-21456
ANTENNAS
Direction finder set, radio
[AD-A149958] N85-21142
A computer analysis of the RF performance of a ground-mounted, air-supported radome
[AD-P004352] N85-21446
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467
Gain enhancement methods for printed circuit antennas
[AD-A150090] N85-21517
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements
[PB85-128148] N85-22265
ANTIFERROMAGNETISM
Investigation of electric and magnetic properties of intercalated graphite
[AD-A149801] N85-21274
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197
ANTIFRICTION BEARINGS
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
ANTIMISTING FUELS
A brief review of the technology of microemulsions and other micellar systems
[AD-A149750] N85-21289
ANTIREFLECTION COATINGS
1.5 to 1.7 micrometers LEDs (Light-Emitting Diode)
[AD-A149685] N85-21508
APERTURES
An investigation of aerowindows for solar receivers
[DE84-010931] N85-21772
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005138] N85-22124
APOLLO SPACECRAFT
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
APPLICATIONS PROGRAMS (COMPUTERS)
METC VAX-IBM guide to ASPEN
[DE85-001974] N85-22031
APPROPRIATIONS
An agenda for a study of government science policy
[GPO-40-860] N85-22245
APPROXIMATION
Alternative approximation concepts for space frame synthesis
[NASA-CR-172526] N85-21150
Recovering pointwise values of discontinuous data within spectral accuracy
[NASA-CR-172535] N85-22049
A two-dimensional smoothing spline and a regression problem
[AD-A149824] N85-22067
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
Rates of convergence of semistochastic approximation procedures for solving stochastic optimization problems N85-22088
Approximation order from certain spaces of smooth bivariate splines on a 3-direction mesh
[AD-A149633] N85-22092
AQUEOUS SOLUTIONS
Compiled and thermodynamic data sources for aqueous and biochemical systems: An annotated bibliography, 1930 - 1983
[PB85-137693] N85-22208
AQUIFERS
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain
[DE85-003294] N85-21864
ARC LAMPS
Life study of RF excited Hg arc lamps and CO2 waveguide lasers
[AD-A149618] N85-21640
ARCHITECTURE
Photovoltaic roofing tile systems N85-21783
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21861
ARCHITECTURE (COMPUTERS)
RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21998
Towards the generation of efficient code from verified programs
[TR-40] N85-22017
ARCTIC REGIONS
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860
ARGON
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624
ARIZONA
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
ARKANSAS
Scan angle and detector effects in Thematic Mapper radiometry — Iowa and Arkansas N85-21735
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
ARM (ANATOMY)
Windblast arm protector assembly
[AD-D011512] N85-21984
ARMED FORCES (FOREIGN)
A review of fatality, impairment of consciousness and head and neck injury on Royal Air Force ejections 1968-1981 N85-21975
ARMED FORCES (UNITED STATES)
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
A review of fatality, impairment of consciousness, and head/neck injury on USAF ejections 1971 - July 1983 N85-21974
AROMATIC COMPOUNDS
Electrostatic potentials: A new method for interpreting and predicting molecular reactivities and for designing synthetic pathways. Applications to nitroaromatics, nitramines and nitrated
[AD-A150120] N85-21298
ARRAYS
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149667] N85-21614
Monolithic short wave infrared (SWIR) detector array
[NASA-CR-175284] N85-21759
ARTIFICIAL INTELLIGENCE
A functional vehicle for autonomous mobile robot research
[AD-A150052] N85-21666
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
The automated reasoning system ITP
[ANL-84-27] N85-22016
Characterizing the parallelism in rule-based expert systems
[DE85-002432] N85-22047
ARTIFICIAL SATELLITES
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
NASA/JSC orbital debris study: Debris model N85-21193
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
ASPARTIC ACID
Blood amino acids of cosmonauts before and after 211-day spaceflight N85-21933
ASPHALT
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184
ASSEMBLIES
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624
Releasable cable connector assembly for use between a mobile and stationary object
[AD-D011538] N85-21655
ASSEMBLY LANGUAGE
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996
ZTL: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 IEEE-488 controller
[LA-10141-MS] N85-22010
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013
ZTLCK: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 real time clock
[LA-10146-MS] N85-22014
TRANIO: A subroutine package for the IBM personal computer to support the transfer 6002 CAMAC crate controller
[LA-10145-MS] N85-22015
ASTRONAUT PERFORMANCE
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985
ASTRONOMICAL MODELS
The axisymmetric pulsar magnetosphere N85-22279
Dynamics of elliptical galaxies and the r sup 1/4 luminosity law N85-22282
Nonlinear evolution of astrophysical Alfven waves N85-22294
About static and dynamic solutions of the aligned rotator model — pulsar magnetospheres N85-22306
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
Equilibrium model of thin magnetic flux tubes — solar atmosphere N85-22310
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313
The influence of the local solar wind structures on the propagation of low energy particles N85-22314
Small scale structure and the Spinar model for active galactic nuclei N85-22316
ASTRONOMY
Research and technology: Fiscal year 1984 report
[NASA-TM-85231] N85-22340

ASTROPHYSICS
JPL highlights, 1983
[NASA-CR-175558] N85-22256
Plasma Astrophysics — conference
[ESA-SP-207] N85-22270
Research in particles and fields
[NASA-CR-175472] N85-22337
Research and technology: Fiscal year 1984 report
[NASA-TM-85231] N85-22340

ASYMPTOTES
Velocity inversion using a stratified reference
[AD-A150082] N85-21858
Asymptotic behavior of matrix coefficients related to reductive symmetric spaces
[CWI-PM-R8410] N85-22095

ASYMPTOTIC METHODS
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072
Singular asymptotic expansions in nonlinear rotordynamics N85-22218

ASYMPTOTIC PROPERTIES
On the coupling of an anchored flame with an acoustic field
[COLL-AERON-8434] N85-21282

ASYMPTOTIC SERIES
Tests of fit based on normalized spacings
[AD-A149749] N85-22062
Asymptotics for configural estimators
[AD-A150106] N85-22087
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179

ATLANTIC OCEAN
The imaging of internal waves by the SEASAT-A synthetic aperture radar
[AD-A149808] N85-21761
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE)
[PB85-128460] N85-21839
Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1982
[AD-A149595] N85-21917

ATMOSPHERIC ATTENUATION
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150

ATMOSPHERIC CHEMISTRY
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823
OSCAR experiment high-density network data report
[DE85-004907] N85-21826
Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena
[PB85-137370] N85-21844
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849
Global tropospheric chemistry: A plan for action
[NASA-CR-175545] N85-21865
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902

ATMOSPHERIC CIRCULATION
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications
[AD-A150097] N85-21900
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902

ATMOSPHERIC COMPOSITION
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURIATE)
[PB85-128460] N85-21839

ATMOSPHERIC CONDUCTIVITY
An improved rocket-borne electric field meter for the middle atmosphere
[NASA-CR-175510] N85-21851
Distribution of atmospheric electric current in the global circuit
[CONTRIB-87] N85-21852

ATMOSPHERIC CORRECTION
LANDSAT-4 Thematic Mapper calibration and atmospheric correction N85-21734
LANDSAT 4 band 6 data evaluation
[E85-10093] N85-21755
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements
[PB85-128148] N85-22265

ATMOSPHERIC DIFFUSION
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399

ATMOSPHERIC EFFECTS
Proposed preliminary design criteria model environment for the 1990's N85-21194
Atmospheric environment for Space Shuttle (STS-51A) launch
[NASA-TM-86497] N85-21875

ATMOSPHERIC MODELS
Wind-tunnel research on the mechanics of plumes in the atmospheric surface layer
[AD-A150019] N85-21584
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
Distribution of atmospheric electric current in the global circuit
[CONTRIB-87] N85-21852
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210

ATMOSPHERIC MOISTURE
Electrochemical cell to measure corrosion rates in noncondensing environments
[DE85-003148] N85-21338
TRAJ: Single station trajectory plot
[PB85-135002] N85-21911

ATMOSPHERIC PHYSICS
Atmospheric transmissometer
[AD-D011540] N85-22140

ATMOSPHERIC PRESSURE
Method of and apparatus for measuring temperature and pressure — atmospheric sounding
[NASA-CASE-GSC-12558-1] N85-21639
Evaluation of ettringite and related compounds for use in solar energy storage
[PB85-146876] N85-21816
Seismic observation of infrasonic signals
[AD-A149574] N85-21853
TRAJ: Single station trajectory plot
[PB85-135002] N85-21911
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237

ATMOSPHERIC SCATTERING
Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations — meteorological radar
[DFVLR-FB-84-42] N85-21485
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327

ATMOSPHERIC TEMPERATURE
Method of and apparatus for measuring temperature and pressure — atmospheric sounding
[NASA-CASE-GSC-12558-1] N85-21639
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860
On the relationship between maximum surface temperature and various parameters; with reference to objective forecasting
[KNMI-TR-58] N85-21905
TRAJ: Single station trajectory plot
[PB85-135002] N85-21911
Monthly and seasonal weather outlook for January 1985, volume 39, number 1
[PB85-148799] N85-21915

ATMOSPHERIC TURBULENCE
Investigations of micro-turbulence in the bottom of the boundary layer
[AD-A149823] N85-21897

ATMOSPHERICS
Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations — meteorological radar
[DFVLR-FB-84-42] N85-21485

ATOMIC COLLISIONS
Bibliography of atomic and molecular processes, 1983
[DE85-000662] N85-22121

ATOMIC INTERACTIONS
Bibliography of atomic and molecular processes, 1983
[DE85-000662] N85-22121

ATOMIC PHYSICS
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419

ATOMIZING
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570

ATTITUDE INDICATORS
Wide-field-of-view, helmet-mounted infinity display system development
[AD-A149641] N85-21159
Attitude data consistence check of rocket payloads
[BMFT-FB-W-84-049] N85-21239

AUDIO EQUIPMENT
Tubes and transistors in audio amplifiers N85-21532

AUDIOMETRY
Second generation USAFSAM (United States Air Force School of Aerospace Medicine) microprocessor audiometer
[AD-A149938] N85-21963

AUGER SPECTROSCOPY
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293

AURORAL ZONES
Experiment for measuring electric fields within the sounding rocket project Energy Budget
[BMFT-FB-W-84-048] N85-21866

AURORAS
Description of the SSB/A (Special Sensor B/Aerospace X-ray spectrometer
[AD-A150040] N85-21236
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855

AUSTENITIC STAINLESS STEELS
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346

AUTOCLAVES
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302

AUTOCORRELATION
Method of multivariant intraclass pattern recognition
[AD-D011546] N85-21405

AUTOMATIC CONTROL
Operations concept for the advanced automation system man-machine interface
[AD-A149797] N85-21139
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
Control of nonlinear objects N85-21561
Reliability analysis of automatic systems
[VTT-301] N85-21682

AUTOMATIC FLIGHT CONTROL
Algorithms for automatic four-dimensional aircraft guidance, considering the momentary wind situation
[DFVLR-FB-84-40] N85-21146
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154
Automatic control design procedures for restructurable aircraft control
[NASA-CR-172489] N85-21173

AUTOMATIC TEST EQUIPMENT
Design of a bit-sliced processor array with built-in-self-test
[AD-A149785] N85-21513

AUTOPSIES
Head/neck injury: Post mortem procedures, Annex B N85-21977

AUTOREGRESSIVE PROCESSES
A review of some aspects of robust inference for time series
[AD-A149706] N85-22082
AVAILABILITY
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
AVERAGE
Models of the upper atmosphere N85-22217
AVIONICS
The evolution of methods of air traffic control
[AD-A149606] N85-21137
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
Proceedings of the 6th Advanced Aircrew Display Symposium
[AD-A150044] N85-21160
Development of the F-20 nose radome
[AD-P004374] N85-21468
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024
Investigation of device and electronic interactions in GaAs device processing
[AD-A149747] N85-22182
AWARDS
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22338
AXES OF ROTATION
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11543-1] N85-21986
AXIAL FLOW
Axial flow laser cavity
[AD-D011506] N85-21633
AXIAL STRESS
Multiaxial stress response of ceramics
[DE85-004350] N85-21379
AXISYMMETRIC FLOW
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231
AZIDES (INORGANIC)
Azido nitramino ether containing solid propellants
[AD-D011511] N85-21392
AZOLES
Theoretical studies on N-bonded pyrazole derivatives of boron
[AD-A150036] N85-21374

B

BACKGROUND RADIATION
Galaxy formation N85-22321
BACKSCATTERING
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
On the inversion of the lidar equation
[AD-A149653] N85-21641
Oceanographic and meteorological research based on the data products of SEASAT
[E85-10091] N85-21753
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths
[NASA-TM-86379] N85-21874
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra
[DE85-003259] N85-22114
Atmospheric transmissometer
[AD-D011540] N85-22140
BACTERIA
Investigation of the initial events in biofouling
[AD-A149995] N85-21927
BALLISTIC MISSILES
NORAD operational system N85-21189
BALLISTIC VEHICLES
An air-breathing ballistic space transporter for Europe
[NASA-TM-77645] N85-21244
BAND STRUCTURE OF SOLIDS
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AbIn2
[AD-A150131] N85-22187
BANDPASS FILTERS
Compensation of skew passband of a SAW filter using predistortion N85-21422
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437
High-frequency input device for superheterodyne radio receiver with wideband preselector N85-21540
Method of designing digital band-pass filters with infinite memory N85-21546
BANDWIDTH
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals
[AD-A149760] N85-21290
Multichannel digital processing of wideband signals N85-21548
An asymptotically efficient solution to the bandwidth problem of kernel density estimation, revision
[AD-A149600] N85-22056
BARIUM TITANATES
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
BAROMETERS
Seismic observation of infrasonic signals
[AD-A149574] N85-21853
BASIC (PROGRAMMING LANGUAGE)
Selection and use of general-purpose programming-language: Program examples, volume 2
[PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1
[PB85-122018] N85-22040
BATHYMETERS
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays
[PB85-129641] N85-21767
BATHYTHERMOGRAPHS
Preliminary results of the oceanographic cruise of USCGC NORTHWIND to the Greenland Sea
[AD-A149802] N85-21919
BEACHES
Hurricane storm surge research
[GPO-40-048] N85-21880
BEAM INJECTION
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
BEAM INTERACTIONS
Statistical phenomena in particle beams
[DE85-001050] N85-22118
BEAM LEADS
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21716
BEAMS (RADIATION)
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21638
Atmospheric transmissometer
[AD-D011540] N85-22140
BEAMS (SUPPORTS)
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694
BEARINGS
Characterization of lubricated bearing surfaces operated under high loads
[NASA-TM-86964] N85-21357
BEER LAW
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
BEHAVIOR
Learning to search. From weak methods to domain-specific heuristics
[AD-A149949] N85-22045
BENZENE
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340
BERYLLIUM
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
BETATRONS
Betatron-synchrotron detrapping in a tapered wiggler free electron laser
[AD-A149686] N85-21642
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study
[AD-A150059] N85-21645
BIAS
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
BIBLIOGRAPHIES
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[PB85-112895] N85-21486
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[DE85-000662] N85-22121
Compiled and thermodynamic data sources for aqueous and biochemical systems: An annotated bibliography, 1930 - 1983
[PB85-137693] N85-22208
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[NASA-TM-83693] N85-22255
List of RAE (Royal Aircraft Establishment) translations issued during the period 1 March 1983 - 31 March 1984
[AD-A149787] N85-22257
BIG BANG COSMOLOGY
Cosmology, galactic astronomy and elementary particle physics N85-22289
Galaxy formation N85-22321
BINARY ALLOYS
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235
BINARY SYSTEMS (MATERIALS)
Investigation of foam flotation and phase partitioning techniques N85-22216
BIOASTRONAUTICS
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
External respiration, gas exchange and energy expenditures of man in weightlessness N85-21932
Blood amino acids of cosmonauts before and after 211-day spaceflight N85-21933
Circadian rhythm of human body temperature during spaceflights N85-21934
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936
Cosmonauts' blood plasma free amino acid levels during preflight training N85-21937
BIOCHEMISTRY
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
Compiled and thermodynamic data sources for aqueous and biochemical systems: An annotated bibliography, 1930 - 1983
[PB85-137693] N85-22208
BIOINSTRUMENTATION
Spirolit-2 instrument used to test pulmonary ventilation N85-21950
BIOLOGICAL EFFECTS
Effects of air pollution and acid rain on forest decline
[GPO-37-459] N85-21818
Summary report of the Workshop on Structure Activity Concepts in Environmental Sciences
[PB85-137339] N85-21841
Biological effects on radiofrequency radiation
[PB85-120848] N85-21930
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[JPRS-USB-85-002] N85-21931
Biological effects of blast and impact waves
[FOA-C-52006-H4-D7] N85-21968
BIOLOGY
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[NASA-SP-7011(267)] N85-21959
BIOMASS
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
BIOMASS ENERGY PRODUCTION
Developments in the production and use of ethanol fuels
[GPO-40-678] N85-21398
BIOMEDICAL DATA
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
BISMUTH
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145

BITUMENS
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184
Stress-relieving interlayers for bituminous resurfacings
[PB85-136885] N85-21415

BIVARIATE ANALYSIS
Approximation order from certain spaces of smooth bivariate splines on a 3-direction mesh
[AD-A149633] N85-22092

BLACK HOLES (ASTRONOMY)
Thermal convection and magnetic fields in accretion disks of black holes N85-22285

BLADE TIPS
Cooled turbine blade tip closure
[AD-D011525] N85-21654

BLAST LOADS
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
Windblast arm protector assembly
[AD-D011512] N85-21984

BLOCKING
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications
[AD-A150097] N85-21900

BLOOD
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
Effect of stationary magnetic field on bleeding time N85-21956

BLOOD PLASMA
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931

BLUFF BODIES
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3866] N85-21166

BODY FLUIDS
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943

BOEING 747 AIRCRAFT
Simultaneous cabin and ambient ozone measurements on two Boeing 747 airplanes. Volume 3: October 1978 - July 1979
[NASA-TM-86883] N85-21872

BOILERS
Carbon granule probe microphone for leak detection — recovery boilers
[NASA-CASE-NPO-16027-1] N85-21597
Steam generator tube vibration tests
[DE85-003599] N85-21712

BOILING
Review of anode phenomena in vacuum arcs
[DE85-002736] N85-22101

BOLTZMANN TRANSPORT EQUATION
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
User's guide for TWODANT: A code package for two-dimensional, diffusion-accelerated, neutral-particle transport
[LA-10049-M] N85-22009
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125
Semiconductor materials for high frequency solid state sources
[AD-A150020] N85-22186

BONDING
Amine salts as bonding agents
[AD-D011543] N85-21396

BOOMS (EQUIPMENT)
Extended moment arm anti-spin device
[NASA-CASE-LAR-12979-1] N85-21147

BOREHOLES
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-408] N85-21699

BORESIGHT ERROR
Electromagnetic analysis of radomes by the moment method
[AD-P004351] N85-21445
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449
Near-field effects on radome boresight errors
[AD-P004356] N85-21450
Automated radome testing
[AD-P004362] N85-21456
Hot radome boresight error measurements
[AD-P004364] N85-21458

BORN APPROXIMATION
Vacancy-rearrangement theory in the first Magnus approximation
[DE85-004435] N85-22123

BORON
Theoretical studies on N-bonded pyrazole derivatives of boron
[AD-A150036] N85-21374

BORON NITRIDES
Tribological properties of boron nitride synthesized by ion beam deposition
[NASA-TM-86962] N85-21355

BOUGUER LAW
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440

BOULES
Ingot slicing machine and method
[NASA-CASE-NPO-15483-1] N85-21650

BOUNDARIES
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330

BOUNDARY LAYER CONTROL
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585

BOUNDARY LAYER EQUATIONS
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072

BOUNDARY LAYER FLOW
A three-dimensional spectral algorithm for simulations of transition and turbulence
[NASA-CR-172561] N85-21575
Wind-tunnel research on the mechanics of plumes in the atmospheric surface layer
[AD-A150019] N85-21584

BOUNDARY LAYER SEPARATION
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150080] N85-21587

BOUNDARY LAYER TRANSITION
Flight-measured laminar boundary-layer transition phenomena including stability theory analysis
[NASA-TP-2417] N85-21118
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
Hydrodynamic stability problem formulated by numerical solutions of the Navier-Stokes equations N85-22223

BOUNDARY LAYERS
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3864] N85-21272
Investigations of micro-turbulence in the bottom of the boundary layer
[AD-A149823] N85-21897
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902

BOUNDARY VALUE PROBLEMS
Comparison of spherical wave ray tracing and exact boundary value solutions for spherical radomes
[AD-P004353] N85-21447
A study of coupling the boundary and finite element methods in two-dimensional elastostatics
[AD-A149619] N85-21702
A convergent series expansion for hyperbolic systems of conservation laws
[NASA-CR-172557] N85-21990
The performance of a type-insensitive Runge-Kutta code on a personal computer
[TUM-I8410] N85-22048
Determining conductivity by boundary measurements. Part 2: Interior results
[AD-A149750] N85-22063

BRAIN
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955

BRAYTON CYCLE
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802

BRIDGES (STRUCTURES)
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108843] N85-21412

BRIGHTNESS
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths
[DE85-000862] N85-21646

BRIGHTNESS TEMPERATURE
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
An analysis of the data obtained by a simultaneous observation of GMS and GMS-2: A study of the difference between the brightness temperatures by GMS and those by GMS-2 N85-21888
VISSR infrared calibration by means of calculated radiances N85-21889

BRITTLE MATERIALS
Reliability of structural brittle materials N85-22222

BRITTLENESS
Moving nonlocal crack: Anti-plane shear case
[AD-A149996] N85-21709

BROADBAND
A broadband kevlar radome for shipboard
[AD-P004365] N85-21459
Multichannel digital processing of wideband signals N85-21548
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723

BROKEN SYMMETRY
Research in theoretical physics
[DE85-004286] N85-22207

BROWNIAN MOVEMENTS
Brownian motion with a parabolic drift and Airy functions
[CWI-MS-R8413] N85-22097
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005138] N85-22124

BUCKLING
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694

BUILDINGS
Phase change thermal energy storage and the model building codes
[PB85-111201] N85-21813
Multiyear plan for experimental systems research passive and hybrid solar energy program
[PB85-146868] N85-21815

BUMPY TORUSES
Suppression of tilting instability of a compact torus by energetic particle beams
[IPPJ-705] N85-22157
Electrostatic confinement in a bumpy torus
[DE85-003794] N85-22164

BUOYANCY
Wind-tunnel research on the mechanics of plumes in the atmospheric surface layer
[AD-A150019] N85-21584
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594

BURNERS
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
BUTANES
Thermophysical properties of working fluids for binary geothermal cycles
[DE85-000385] N85-21604

C

CABIN ATMOSPHERES
Simultaneous cabin and ambient ozone measurements on two Boeing 747 airplanes. Volume 3: October 1978 - July 1979
[NASA-TM-86683] N85-21872
CADMIUM SELENIDES
Development of a CdSe thin film solar cell N85-21796
CADMIUM SULFIDES
Testing and optimization of the production technology of large-surface Cu2S/CdS solar generators N85-21793
Physical-chemical investigations of copper sulfides for use in CdS/Cu2S solar cells N85-21794
CALCIUM
Evaluation of ettringite and related compounds for use in solar energy storage
[PB85-146876] N85-21816
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916
CALCIUM SULFIDES
Evaluation of ettringite and related compounds for use in solar energy storage
[DE85-003249] N85-21809
CALIBRATING
Radar calibration using direct measurement equipment and oblique photometry
[AD-D011530] N85-21433
Method and apparatus for self-calibration and phasing of array antenna
[NASA-CASE-NPO-15920-1] N85-21493
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
VISSR infrared calibration by means of calculated radiances N85-21889
GMS operational calibration procedure and status N85-21893
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
Fast times at high temperatures
[DE85-003306] N85-22205
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
CALIFORNIA
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922
The future of lightwave technology
[PB85-109759] N85-22155
CALORIMETERS
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
CAMERAS
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
Intensified CCD camera system for plasma diagnostics
[DE85-002252] N85-21620
CANOPIES (VEGETATION)
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10082] N85-21747
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825
CANTILEVER BEAMS
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration
[DE85-000467] N85-21618
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175586] N85-21693
CANYONS
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
CAPACITANCE
New preamplifier for particle detectors
[DE85-004115] N85-21524
CAPACITORS
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
CAPE KENNEDY LAUNCH COMPLEX
Preliminary results of associating cloud-to-ground lightning with surface convergence and radar reflectivity at Kennedy Space Center in 1983
[NASA-CR-175543] N85-21910
Chronology of KSC and KSC related events for 1983
[NASA-TM-87435] N85-22339
CARBIDES
Neutron scattering studies of graphite intercalation compounds
[DE85-003079] N85-22196
CARBOHYDRATE METABOLISM
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
CARBON
Carbon filter plates for aluminum filtration at casting
[BMFT-FB-T-84-242] N85-21343
Carbon granule probe microphone for leak detection --- recovery boilers
[NASA-CASE-NPO-16027-1] N85-21597
CARBON ARCS
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
CARBON DIOXIDE
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149813] N85-21291
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916
CARBON DIOXIDE LASERS
Life study of RF excited Hg arc lamps and CO2 waveguide lasers
[AD-A149618] N85-21640
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150
CARBON FIBERS
Composite structural materials
[NASA-CR-175515] N85-21268
CARBON MONOXIDE
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288
CARBON STEELS
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology
[BMFT-FB-T-84-236] N85-21672
CARBORANE
The synthesis, structural characterization and reactions of closo-Rhodacarborane Anions containing a formal d8 metal vertex 1,2
[AD-A149640] N85-21285
CARDIOVASCULAR SYSTEM
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
LBNP training of crew members on main missions aboard Salyut-6 orbital station N85-21938
Main component method used to study variations of cardiovascular parameters N85-21939
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Preventive effect of acute heat factors during hypokinesia N85-21945
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
CARRIER FREQUENCIES
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar
[AD-D011561] N85-21436
Wideband phase keyers N85-21544
CARRIER MOBILITY
Characterization of high temperature electrically conducting oxides
[DE85-004296] N85-21307
CASTING
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V --- titanium alloy
[DGT-25369-PT-1] N85-21341
Carbon filter plates for aluminum filtration at casting
[BMFT-FB-T-84-242] N85-21343
Nondestructive testing of stainless steel to improve quality and output efficiency of the processing of ingot and continuous casting
[BMFT-FB-T-84-240] N85-21345
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409
Development of silicon nitride materials for the casting of solar cell silicon N85-21779
CASTINGS
Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
CASUALTIES
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
A review of neck injury and impaired consciousness associated with US Navy ejections 1 January 1969 - 31 December 1979 N85-21973
A review of fatality, impairment of consciousness, and head/neck injury on USAF ejections 1971 - July 1983 N85-21974
A review of fatality, impairment of consciousness and head and neck injury on Royal Air Force ejections 1968-1981 N85-21975
Head/neck injury: Post mortem procedures, Annex B N85-21977
CATALASE
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
CATALYSIS
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312
Solar-assisted hydrogen generation by photoelectrocatalysis
[PB85-149706] N85-21314
The use of hydrazine as an alternate source of energy
[NASA-CR-175535] N85-21397
CATALYSTS
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149813] N85-21291
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
Properties of supported metal catalysts
[DE85-003927] N85-21303
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340
Fluorinated polyurethanes
[AD-D011526] N85-21353
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
CATARACTS
Technical support for microwave experiments on the eye lens
[AD-A149702] N85-22144
CATHODE RAY TUBES
Device for controlling operation of lithicon cathode-ray memory tube N85-21542

CATHODES
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366
CAVITIES
An investigation of compressible flows over open cavities including sheer layer thickness effects
[AD-A150086] N85-21588
An investigation of aerowindows for solar receivers
[DE84-010931] N85-21772
CAVITY RESONATORS
Single-cavity SLED device
[DE85-002587] N85-22117
CELLS (BIOLOGY)
Purification and cultivation of human pituitary growth hormone secreting cells
[NASA-CR-171846] N85-21923
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Investigation of foam flotation and phase partitioning techniques N85-22216
CEMENTS
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
Hazardous air pollutants: Dry-deposition phenomena
[PB85-136279] N85-21843
CENSORED DATA (MATHEMATICS)
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
CENTRIFUGING
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration
[DE85-000467] N85-21618
CENTROIDS
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269
CERAMIC COATINGS
Thermal barrier coating system
[NASA-CASE-LEW-13324-2] N85-21266
Tribological properties of boron nitride synthesized by ion beam deposition
[NASA-TM-86962] N85-21355
CERAMICS
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358
Evaluation of corrosion-erosion behavior of various ceramic materials
[AD-A149756] N85-21367
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
Multiaxial stress response of ceramics
[DE85-004350] N85-21379
Technological and economic assessment of advanced ceramic materials. Volume 1: Summary and conclusions
[PB85-113082] N85-21383
Technological and economic assessment of advanced ceramic materials. Volume 2: A case study of ceramics in heat engine applications
[PB85-113090] N85-21384
Technological and economic assessment of advanced ceramic materials: Volume 4: A case study of integrated optic devices
[PB85-113116] N85-21385
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools
[PB85-113132] N85-21387
High-technology ceramics in Japan
[PB85-125029] N85-21389
Slip casting and nitridation of silicon powder
[NASA-TM-77809] N85-21406
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214
CERIUM COMPOUNDS
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195
CHANNEL FLOW
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
A three-dimensional spectral algorithm for simulations of transition and turbulence
[NASA-CR-172561] N85-21575
CHANNELS
The effect of jamming/deception on decision making
[AD-A149740] N85-21472
CHANNELS (DATA TRANSMISSION)
The 20:16 block code for digital recording and transmission channels
[BBC-RD-1985/1] N85-21443
Digital channel efficiency model
[AD-A150084] N85-21479
CHAPMAN-ENSKOG THEORY
Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573
CHARACTERIZATION
The synthesis, structural characterization and reactions of closo-Rhodicarborane Anions containing a formal d8 metal vertex 1,2
[AD-A149640] N85-21285
Production and characterization of amorphous silicon (a-Si:H) as base material for solar cells N85-21791
Electrical characterization of analog microprocessors
[AD-A149629] N85-21995
CHARGE CARRIERS
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181
CHARGE COUPLED DEVICES
Intensified CCD camera system for plasma diagnostics
[DE85-002252] N85-21620
Monolithic short wave infrared (SWIR) detector array
[NASA-CR-175284] N85-21759
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266
CHARGE EFFICIENCY
State-of-charge coulometer
[NASA-CASE-NPO-15759-1] N85-21596
CHARGE EXCHANGE
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126
CHARGE TRANSFER
Process for preparing highly optically transparent-colorless armomatic polyimide film
[NASA-CASE-LAR-13351-1] N85-21360
CHARGED PARTICLES
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855
CHECKOUT
Definition of ground test for Large Space Structure (LSS) control verification
[NASA-TM-86495] N85-21249
Two-phase flow in geothermal systems
[DE85-004692] N85-21591
CHEMICAL ANALYSIS
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water
[DE85-002781] N85-21619
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21832
Standard analytical procedures of the NOAA National Analytical Facility, 1984-85: Extractable toxic organic compounds
[PB85-126282] N85-21840
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
Analyses via automated mass spectrometry (MS/DS) N85-22227
CHEMICAL BONDS
Theoretical studies on N-bonded pyrazole derivatives of boron
[AD-A150036] N85-21374
CHEMICAL COMPOSITION
Plasticizer system for propellant compositions
[AD-D011514] N85-21393
Summary report of the Workshop on Structure Activity Concepts in Environmental Sciences
[PB85-137339] N85-21841
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214
Cosmic ray composition and origin N85-22287
CHEMICAL PROPERTIES
A brief review of the technology of microemulsions and other micellar systems
[AD-A149759] N85-21289
CHEMICAL REACTIONS
A study of organic chemical reactions in microemulsions
[AD-A150063] N85-21265
Process for producing tris s(n-methylamino) methylsilane
[NASA-CASE-MFS-25721-1] N85-21280
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297
Electrostatic potentials: A new method for interpreting and predicting molecular reactivities and for designing synthetic pathways. Applications to nitroaromatics, nitramines and nitrated
[AD-A150120] N85-21298
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
Low temperature deposition of nickel films
[AD-D011568] N85-21319
Chemical approach for controlling nadimide cure temperature and rate
[NASA-CASE-LEW-13770-5] N85-21352
Amine salts as bonding agents
[AD-D011543] N85-21396
CHEMICAL REACTORS
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload
[NASA-TM-86487] N85-21187
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
CHEMILUMINESCENCE
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286
CHEMISORPTION
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334
CHINA
China report: Science and technology
[JPRS-CST-85-008] N85-21416
Systems research on China in year 2000 N85-21418
Studies of the development of cyclones over Southern China coastal areas and adjacent seas
[AD-A150108] N85-21901
CHIPS (ELECTRONICS)
Design of a bit-sliced processor array with built-in-self-test
[AD-A149785] N85-21513
Built-in tests for VLSI (Very Large Scale Integration) finite-state machines
[AD-A149784] N85-21997
CHLORIDES
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
CHROMIUM
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel
[AERE-R-11034] N85-21315
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27
[NASA-TP-2443] N85-21323
CHROMIUM ALLOYS
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624
CHROMOSPHERE
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330
CHRONOLOGY
Chronology of KSC and KSC related events for 1983
[NASA-TM-87435] N85-22339

CIRCADIAN RHYTHMS
Circadian rhythm of human body temperature during spaceflights N85-21934
Annals of the New York Academy of Sciences, Volume 423 — timing and time perception
[AD-A150031] N85-21981
CIRCUIT BOARDS
The state of the art in printed wiring board inspection
[AD-A149871] N85-21679
CIRCUIT BREAKERS
High-voltage, high-power, solid-state remote power controllers for aerospace applications
[NASA-TP-2437] N85-21263
CIRCUIT RELIABILITY
Transistor-transistor logic microcircuit tester N85-21556
CIRCUITS
Digital channel efficiency model
[AD-A150084] N85-21479
Electromagnetic rail launcher as a circuit element
[AD-A150067] N85-21516
Summator of radio pulse signals N85-21539
CIRCULAR CYLINDERS
Electromagnetic analysis of radomes by the moment method
[AD-P004351] N85-21445
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
CIRCUMSOLAR RADIATION
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278
CIVIL AVIATION
General aviation activity and avionics survey
[AD-A149572] N85-21103
Transportation
[JPRS-UTR-85-004] N85-21105
Aviation repair plant directors on quality control measures N85-21106
New flight simulators at Vnukovo permit less in-flight training N85-21107
Annual review of aircraft accident data: US air carrier operations calendar year 1981
[NTSB/ARC-85/01] N85-21134
CLADDING
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology
[BMFT-FB-T-84-236] N85-21672
Ring-on-ring tests and load capacity of cladding glass
[PB85-106391] N85-21717
CLAMPS
Reusable thermal cycling clamp
[NASA-CASE-LAR-12868-1] N85-21651
Pneumatic clamping device
[AD-D011544] N85-21656
CLASSIFICATIONS
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape
[AD-A149981] N85-22147
On the morphology of spiral modes — disk galaxies N85-22283
CLEANERS
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
CLEANING
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
Steam generator tube vibration tests
[DE85-003599] N85-21712
CLIMATE
Oceanic role in terrestrial climate
[DE85-004422] N85-21904
Impact of aerosols on visibility and climate: A report prepared for Panel 3, Environmental Impact, of the NATO/CCMS Air Pollution Pilot Study on Air Pollution Control Strategies and Impact Modelling
[PB85-106744] N85-21906
CLIMATOLOGY
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010613] N85-21798
NBS solar collector durability/reliability test program
[DE85-003489] N85-21801
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21829
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline
[AD-A149957] N85-21857
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
A new NASA/MSFC mission analysis global cloud cover data base
[NASA-TP-2448] N85-21878
Los Alamos MINI-Review: Tracking Antarctic winds
[DE85-004597] N85-21903
Earth radiation budget experiment software development
[NASA-CR-172567] N85-22002
CLINICAL MEDICINE
Review of US manual of clinical aviation medicine N85-21957
The clinical and radiological assessment of cervical injury, Annex A N85-21976
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
Medical subject headings, tree structures, 1985
[PB84-216092] N85-22261
Permuted medical subject headings, 1985
[PB84-216100] N85-22262
Technology transfer to the Middle East
[PB85-127744] N85-22264
CLOCKS
Laser clock
[AD-D011513] N85-21634
CLOSED CYCLES
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671
CLOSED ECOLOGICAL SYSTEMS
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948
CLOSURES
Cooled turbine blade tip closure
[AD-D011525] N85-21654
CLOUD COVER
A new NASA/MSFC mission analysis global cloud cover data base
[NASA-TP-2448] N85-21878
CLOUDS
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21638
CLOUDS (METEOROLOGY)
Accuracy of typhoon center determined by GMS imagery N85-21887
A supplement study on the subsynoptic cloud system off the south coast of Japan N85-21892
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
CLUMPS
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612
CLUSTER ANALYSIS
Technical support for creating an artificial intelligence system for feature extraction and experimental design
[NASA-CR-175286] N85-22044
Multi-sample cluster analysis as an alternative to multiple comparison procedures
[AD-A149960] N85-22084
COAL UTILIZATION
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671
COALESCING
Signatures of the coalescence instability in solar flares N85-22293
COASTAL WATER
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922
COASTS
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE)
[PB85-128460] N85-21839
Studies of the development of cyclones over Southern China coastal areas and adjacent seas
[AD-A150108] N85-21901
COATINGS
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108843] N85-21412
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-175507] N85-21438
Advanced thin film thermocouples
[NASA-CR-175541] N85-21607
COAXIAL CABLES
A moment solution for an arbitrary configuration of partly shielded wires above a ground plane
[AD-A149762] N85-21473
COBALT ALLOYS
Proton NMR and susceptibility measurements in TiCoH/sub x
[DE85-003309] N85-21336
COBOL
Selection and use of general-purpose programming-language: Program examples, volume 2
[PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1
[PB85-122018] N85-22040
COCKPITS
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
CODING
Integrated control system engineering support
[AD-A149742] N85-21177
Automatic multi-banking of memory for microprocessors
[NASA-CASE-NPO-15295-1] N85-21992
COEFFICIENT OF FRICTION
Effects of B, Ti and Ta implantation on the wear resistance of Fe and Ni-plated Fe
[AD-A149947] N85-21330
COGENERATION
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671
COHERENT RADAR
Digital coherent detector
[AD-D011560] N85-21501
COHERENT RADIATION
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481
COLD SURFACES
Low temperature deposition of nickel films
[AD-D011568] N85-21319
COLLISION AVOIDANCE
Collision avoidance for Naval training aircraft
[FAA/PM-84-4] N85-21136
COLLISION PARAMETERS
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005138] N85-22124
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
COLLISIONAL PLASMAS
Analysis and computations of microwave-atmospheric interactions
[AD-A149666] N85-21854
COLLISIONLESS PLASMAS
Strong iron accelerating by collisionless magnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
COLLISIONS
Orbital Debris
[NASA-CP-2360] N85-21188
NASA/JSC orbital debris study: Debris model N85-21193
Assessment of satellite collision hazards by simulated sampling in space N85-21195
A model for the evolution of on-orbit manmade debris environment N85-21196
Geosynchronous satellite collision avoidance N85-21197
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
Debris impact on Earth-orbiting spacecraft N85-22234
COLOR
Proceedings of the 6th Advanced Aircrew Display Symposium
[AD-A150044] N85-21160
Television animation store: Digital chroma, key and mixer units
[BBC-RD-1984/16] N85-21442

COLOR CODING
Choice reaction time and color: An annotated bibliography
[AD-A149722] N85-21979
COLORADO
Measurements of the surface energy budget in the southern Gobi Desert of China, and in the Rocky Mountains of Colorado
[NASA-CR-175506] N85-21847
COMBINATORIAL ANALYSIS
Multi-sample cluster analysis as an alternative to multiple comparison procedures
[AD-A149960] N85-22084
COMBUSTIBLE FLOW
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3866] N85-21166
Investigation of flowfields found in typical combustor geometries
[NASA-CR-3869] N85-21167
COMBUSTION
Combustion gas properties. 2: Natural gas fuel and dry air
[NASA-TP-2435] N85-21168
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399
COMBUSTION CHAMBERS
Advanced liner-cooling techniques for gas turbine combustors
[NASA-TM-86952] N85-21115
Combustion research for gas turbine engines
[NASA-TM-86963] N85-21164
Investigation of flowfields found in typical combustor geometries
[NASA-CR-3869] N85-21167
On the coupling of an anchored flame with an acoustic field
[COLL-AERON-8434] N85-21282
COMBUSTION PHYSICS
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
[NASA-TM-83590] N85-21162
COMBUSTION PRODUCTS
Combustion gas properties. 2: Natural gas fuel and dry air
[NASA-TP-2435] N85-21168
Kinetics of nitric oxide formation in laminar and turbulent methane combustion
[PB85-149696] N85-21313
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials
[AD-A149647] N85-21961
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report
[DE85-003715] N85-22169
COMBUSTION STABILITY
An investigation of space shuttle main engine shutdown chugging instability N85-22221
COMBUSTION VIBRATION
An investigation of space shuttle main engine shutdown chugging instability N85-22221
COMET NUCLEI
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives
[NASA-TM-77536] N85-22324
COMETS
Magnetospheres in the solar system N85-22274
COMMAND AND CONTROL
Optimization of guidance and control using function minimization and NAVSTAR/GPS
[AD-A149956] N85-21141
The effect of jamming/deception on decision making
[AD-A149740] N85-21472
COMMUNICATION CABLES
Optical fiber communications link design in compliance with systems performance standards
[PB85-111037] N85-21489
COMMUNICATION NETWORKS
Base communications issues for the 1980s
[AD-A149764] N85-21474
Space Shuttle interactive meteorological data system study
[NASA-CR-171418] N85-21876
COMMUNICATION SATELLITES
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Engineering calculations for communications satellite systems planning
[NASA-CR-175552] N85-21233
Radioelectronics and space exploration N85-21533
Satellite communications and amateur radio N85-21534
COMMUNICATION THEORY
The study of certain aspects of probability with applications in communications theory
[AD-A149820] N85-21476
COMMUTATORS
Summator of radio pulse signals N85-21539
COMPARISON
Cost comparison of small gas turbines versus electric motors in a variable load industrial application
[PB85-149763] N85-21530
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
COMPENSATORS
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
COMPILERS
An algorithm for generating abstract syntax trees
[NASA-CR-172541] N85-22003
A Gypsy-to-Ada program compiler
[TR-39] N85-22005
Programs for dynamic loading of precompiled subroutine packages, especially for applications with the Watfiv compiler
[DFVLR-MITT-84-18] N85-22035
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[PB85-107993] N85-22037
Ryan-McFarland Corporation, sun microsystem with sky fast floating point processor, RM/FORTRAN version 1.5.0
[PB85-108009] N85-22038
COMPOSITE MATERIALS
Composite structural materials
[NASA-CR-175515] N85-21268
Temperature responses of composite panels
[AD-A150053] N85-21277
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-4] N85-21351
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
Fiber reinforced fused silica for hypersonic radome applications
[AD-P004366] N85-21460
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[AD-A150042] N85-21710
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238
COMPOSITE PROPELLANTS
Plasticizer system for propellant compositions
[AD-D011502] N85-21390
COMPOSITE STRUCTURES
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends
[NASA-TM-86355] N85-21270
Temperature responses of composite panels
[AD-A150053] N85-21277
COMPRESSIBILITY
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
COMPRESSIBLE FLOW
An investigation of compressible flows over open cavities including shear layer thickness effects
[AD-A150086] N85-21588
COMPRESSION LOADS
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
COMPRESSORS
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
COMPUTATION
Instrumentation award
[AD-A150081] N85-21999
PISCES: An environment for parallel scientific computation
[NASA-CR-172544] N85-22004
Surface forward scattering and reflection
[AD-A150115] N85-22112
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-cometary and planetary studies
[NASA-CR-175490] N85-22331
COMPUTATIONAL FLUID DYNAMICS
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113
Combustion research for gas turbine engines
[NASA-TM-86963] N85-21164
China report: Science and technology
[JPRS-CST-85-008] N85-21416
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
COMPUTATIONAL GRIDS
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149851] N85-21582
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
Mesh effects on the computation of non-linear gravity waves of arbitrary discharge
[COLL-AERON-8501] N85-21848
Differentiating matrices for arbitrarily spaced grid points
[NASA-CR-172556] N85-22051
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
Approximation order from certain spaces of smooth bivariate splines on a 3-direction mesh
[AD-A149633] N85-22092
COMPUTER AIDED DESIGN
ACOSS 17 (Active Control of Space Structures)
[AD-A150007] N85-21253
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
Structural sensitivity analysis: Methods, applications and needs
[NASA-TM-85827] N85-21695
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240
COMPUTER AIDED MANUFACTURING
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
The EEC's information technology program: An update
[AD-A150022] N85-22258
COMPUTER DESIGN
Automatic multi-banking of memory for microprocessors
[NASA-CASE-NPO-15295-1] N85-21992
COMPUTER GRAPHICS
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744
Review of computer mapping and display techniques applicable to regional analysis
[DE85-003545] N85-21764
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013

Tekedit: An enhanced editor for Direct View Storage Tube (DVST) graphics display devices
[AD-A149715] N85-22021
Design of graphic displays in computerized systems
[AD-A150071] N85-22027
EZPIX: A tablet entry method for computer-generated slides, drawings, and graphs
[DE85-005234] N85-22030

COMPUTER INFORMATION SECURITY
Computer and communications security and privacy
[GPO-39-741] N85-21994

COMPUTER NETWORKS
Multicomputer communication system
[NASA-CASE-NPO-15433-1] N85-21428
Collection and use of lightning strike data in the western US during summer 1983
[PB85-110534] N85-21907
Computing Division two-year operational plan, FY 1984 - 1985
[LA-9978-MS] N85-22006

COMPUTER PROGRAMMING
Integrated control system engineering support
[AD-A149742] N85-21177
Universal file processing program for field programmable integrated circuits
[DE85-004384] N85-21526
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000
PISCES: An environment for parallel scientific computation
[NASA-CR-172544] N85-22004
Towards the generation of efficient code from verified programs
[TR-40] N85-22017
Very-high level concurrent programming
[AD-A150009] N85-22026
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VAX-ASPEN installation guide
[DE85-001973] N85-22032
Programs for dynamic loading of precompiled subroutine packages, especially for applications with the Watfiv compiler
[DFVLR-MITT-84-18] N85-22035
A formal method for specifying computer resources in an implementation independent manner
[AD-A149955] N85-22043
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
Requirements for a database management system
[DE85-004861] N85-22259

COMPUTER PROGRAMS
Sample size and precision in communication performance measurements
[PB85-1143270] N85-21488
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9667-MS] N85-21576
3-D inelastic analysis methods for hot section components (base program) — turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742
User's manual for the University of Houston individual heliostat layout and performance code
[DE85-004643] N85-21808
Investigations of micro-turbulence in the bottom of the boundary layer
[AD-A149823] N85-21897
FTASUM: Aviation forecast summaries
[PB85-112977] N85-21908
SAOSUM: A short summary of observations
[PB85-120384] N85-21909
TRAJ: Single station trajectory plot
[PB85-135002] N85-21911
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[PB85-137586] N85-21913
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Computing Division two-year operational plan, FY 1984 - 1985
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[LA-9969-MS] N85-22007
User's guide for TWODANT: A code package for two-dimensional, diffusion-accelerated, neutral-particle transport
[LA-10049-M] N85-22009
Adaptive meshes in the 2DL code
[LA-9938-MS] N85-22011
The automated reasoning system ITP
[ANL-84-27] N85-22016
A user's guide to sensitivity testing on computer models at Los Alamos National Laboratory
[LA-10104-M] N85-22018
The portable LISP translation tool
[AD-A149765] N85-22023
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024
MFTF sensor verification computer program
[DE85-004452] N85-22029
EZPIX: A tablet entry method for computer-generated slides, drawings, and graphs
[DE85-005234] N85-22030
VAX-ASPEN installation guide
[DE85-001973] N85-22032
Software for special functions
[DE85-004884] N85-22033
Parallel linear algebra library for the Denelcor HEP
[DE85-004885] N85-22034
SIMULA: Digital controller simulation package
[PB85-134492] N85-22041
Experimental mathematics
[CWI-PM-R8411] N85-22096
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125
Strong iron accelerating by collisionless magnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
Models of the upper atmosphere N85-22217
A study of the compatibility of an existing CFD package with a broader class of material constitutions N85-22219
Analyses via automated mass spectrometry (MS/DS) N85-22227
Evaluation of expert systems N85-22229

COMPUTER STORAGE DEVICES
Redundancy of codes for detection and correction of unidirectional errors N85-21557
Variable data base generator apparatus
[AD-D011515] N85-21993
Problems in decentralized decision making and computation
[AD-A150025] N85-22251

COMPUTER SYSTEMS DESIGN
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000

COMPUTER SYSTEMS PROGRAMS
Application of model following control and estimation techniques to attitude control of maneuvering spacecraft. Part 2: Simulation software description
[NLR-TR-82116-U-PT-2] N85-21254
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024

COMPUTER TECHNIQUES
A computer analysis of the RF performance of a ground-mounted, air-supported radome
[AD-P004352] N85-21448
Radioelectronics and space exploration N85-21533
The man-machine interface
[AD-A149971] N85-21989
A computer-based gaming system for assessing recognition performance (RECOG)
[AD-A149752] N85-22022
Very-high level concurrent programming
[AD-A150009] N85-22026
Experimental mathematics
[CWI-PM-R8411] N85-22096
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240
Theoretical interpretation of thermal arrest data from differential thermal analysis measurements N85-22241
The EEC's information technology program: An update
[AD-A150022] N85-22258

COMPUTERIZED SIMULATION
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156

A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile
[NASA-TM-85904] N85-21245
A computer simulation of thin film nucleation and growth: The Volmer-Weber case
[NASA-TM-86968] N85-21264
Near-field effects on radome boresight errors
[AD-P004356] N85-21450
Nickel-cadmium battery cell reversal from resistive network effects
[AD-A149626] N85-21505
Concurrent simulation techniques exploiting hierarchy
[AD-A149783] N85-21512
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates
[FOA-C-30383-E] N85-21527
Computer simulation of equipment and processes involved in high-frequency heating of dielectrics N85-21555
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149687] N85-21614
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution
[NASA-TM-86913] N85-21690
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
Numerical simulation of static and dynamic shadow patterns using an atomistic description of crack initiation and propagation
[DE85-003226] N85-21715
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
The automated reasoning system ITP
[ANL-84-27] N85-22016
A user's guide to sensitivity testing on computer models at Los Alamos National Laboratory
[LA-10104-M] N85-22018
SIMULA: Digital controller simulation package
[PB85-134492] N85-22041
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
Simulation of space charge effects in particle accelerators
[DE85-001826] N85-22120
Electron image simulation: A complementary processing technique
[DE85-000685] N85-22190
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COMPUTERS
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[LA-9978-MS] N85-22006
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[GPO-41-058] N85-22243
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248

CONCATENATED CODES
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001

CONCENTRATION (COMPOSITION)
Simultaneous cabin and ambient ozone measurements on two Boeing 747 airplanes. Volume 3: October 1978 - July 1979
[NASA-TM-86883] N85-21872
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[AD-A149698] N85-21988

Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181

CONCRETES
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703

CONDENSATION NUCLEI
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3674] N85-21675

CONDENSERS (LIQUEFIERS)
Direct-contact condensers for solar pond power production
[DE84-004510] N85-21771

CONDUCTION BANDS
The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184

CONDUCTIVE HEAT TRANSFER
Temperature responses of composite panels
[AD-A150053] N85-21277
Models of the upper atmosphere N85-22217

CONDUCTORS
Control of electronic, magnetic and optical properties of doped polyacetylene conductors
[AD-A150117] N85-21375
Performance ranges of helical antenna made of conductor with extra bends N85-21536

CONFERENCES
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[AD-A150044] N85-21160
Orbital Debris
[NASA-CP-2360] N85-21188
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The future of lightwave technology
[PB85-109759] N85-22155
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[AD-A149621] N85-22248
Plasma Astrophysics — conference
[ESA-SP-207] N85-22270

CONFIDENCE LIMITS
An asymptotically optimal subclass of BTIB designs for comparisons with a control
[AD-A149819] N85-22066

CONFINEMENT
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160

CONGRESSIONAL REPORTS
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[GPO-38-948] N85-21131
Legislation to improve airline safety
[GPO-38-222] N85-21132
Commercial space launches
[S-REPT-98-656] N85-21225
Brussels Satellite Convention
[S-EXEC-REPT-98-52] N85-21234
Results of Space Shuttle flight 41-D
[GPO-39-481] N85-21243
Developments in the production and use of ethanol fuels
[GPO-40-678] N85-21398
Effects of air pollution and acid rain on forest decline
[GPO-37-459] N85-21818
Wind shear detection technology
[GPO-38-920] N85-21879
Hurricane storm surge research
[GPO-40-048] N85-21880
Computer and communications security and privacy
[GPO-39-741] N85-21994
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy
[GPO-41-060] N85-22244
An agenda for a study of government science policy
[GPO-40-860] N85-22245
Transfer of technology
[S-REPT-98-664] N85-22246
Transfer of technology
[S-HRG-98-966] N85-22247
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254
Summary of activities of the Committee on Science and Technology
[H-REPT-98-1189] N85-22341

CONNECTORS
Connection system — insuring against loss of a tool component without using multiple tethers
[NASA-CASE-MSC-20319-1] N85-21649
Releasable cable connector assembly for use between a mobile and stationary object
[AD-D011538] N85-21655

CONSERVATION LAWS
A convergent series expansion for hyperbolic systems of conservation laws
[NASA-CR-172557] N85-21990

CONSTANTS
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849
Conserved quantities and radiative aspects of asymptotically anti-de Sitter space-times N85-22303

CONSTITUTIVE EQUATIONS
Viscoplastic constitutive relationships with dependence on thermomechanical history
[NASA-CR-174836] N85-21691

CONSTRUCTION
New runway enables IL-76 flights to Tenkeli in far north N85-21108
Stress-relieving interlayers for bituminous resurfacings
[PB85-136885] N85-21415
Phase change thermal energy storage and the model building codes
[PB85-111201] N85-21813

CONSTRUCTION MATERIALS
Hazardous air pollutants: Dry-deposition phenomena
[PB85-138279] N85-21843

CONSUMPTION
Cosmonauts' blood plasma free amino acid levels during preflight training N85-21937

CONTAMINANTS
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149698] N85-21988

CONTINENTAL SHELVES
Preliminary results of the oceanographic cruise of USCGC NORTHWIND to the Greenland Sea
[AD-A149802] N85-21919
Biological processes in the water column of the South Atlantic Bight. Volume 1: Published manuscripts
[DE85-004610] N85-21929
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida
[AD-A149869] N85-22111

CONTINUITY EQUATION
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179

CONTINUOUS SPECTRA
The continuous spectrum of an axisymmetric, self-gravitating equilibrium in the presence of a poloidal magnetic field N85-22315

CONTINUOUS WAVE LASERS
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644

CONTINUUM FLOW
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571

CONTINUUM MECHANICS
Axiomatic characterizations of continuum structure functions
[AD-A149817] N85-21706
A solution method for nonlinear dynamic analysis of shell structures
[AD-A149846] N85-21708
Adaptive meshes in the 2DL code
[LA-9938-MS] N85-22011

CONTRACTORS
Integrated control system engineering support
[AD-A149742] N85-21177

CONTROL
Television camera video level control system
[NASA-CASE-MSC-18578-1] N85-21427
Transfer of technology
[S-REPT-98-664] N85-22246

CONTROL SIMULATION
Application of model following control and estimation techniques to attitude control of maneuvering spacecraft. Part 2: Simulation software description
[NLR-TR-82116-U-PT-2] N85-21254

CONTROL SYSTEMS DESIGN
Automatic control design procedures for restructurable aircraft control
[NASA-CR-172489] N85-21173
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175
Application of model following control and estimation techniques to attitude control of maneuvering spacecraft. Part 2: Simulation software description
[NLR-TR-82116-U-PT-2] N85-21254

CONTROL THEORY
Needs, opportunities, and options for large scale systems research
[DE85-004642] N85-22091

CONTROLLABILITY
A functional vehicle for autonomous mobile robot research
[AD-A150052] N85-21666

CONTROLLED ATMOSPHERES
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149698] N85-21988

CONTROLLERS
Microprocessor-controlled rotating shadowband radiometer
[DE85-003633] N85-21630

CONVECTION
Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116176] N85-21831
Observational study of transport in the free troposphere
[PB85-144145] N85-21845
Thermal convection and magnetic fields in accretion disks of black holes N85-22285

CONVECTIVE FLOW
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863

CONVECTIVE HEAT TRANSFER
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863

CONVERGENCE
A method of calculating periodic solutions of second order dynamical systems
[AD-A149634] N85-22058
Determining conductivity by boundary measurements. Part 2: Interior results
[AD-A149750] N85-22063
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision
[AD-A149997] N85-22068
Convergence rates in the strong law for bounded mixing sequences
[CWI-MS-R8412] N85-22076
Rates of convergence of semistochastic approximation procedures for solving stochastic optimization problems N85-22068

CONVERGENT-DIVERGENT NOZZLES
Vacuum chamber pressure effects on thrust measurements of low Reynolds number nozzles
[NASA-TM-86955] N85-21259

COOLING
Improvements in glazings: SERI materials research in progress
[DE84-013049] N85-21378
Heat pipe cooled probe
[NASA-CASE-LAR-12588-1] N85-21568

Cooled turbine blade tip closure
[AD-D011525] N85-21654
COOLING SYSTEMS
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636
COORDINATE TRANSFORMATIONS
Distance-inertial guidance of launch vehicle described N85-21417
COORDINATES
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746
COPOLYMERS
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-4] N85-21351
Metal (11) 4,4',4',4''-phthalocyanine tetrasmines as curing agents for epoxy resins
[NASA-CASE-ARC-11424-1] N85-21361
COPPER ALLOYS
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346
COPPER SELENIDES
Low cost, sprayed CuInSe2 solar cell research
[DE85-003467] N85-21799
COPPER SULFIDES
Testing and optimization of the production technology of large-surface Cu2S/CdS solar generators N85-21793
Physical-chemical investigations of copper sulfides for use in CdS/Cu2S solar cells N85-21794
CORN
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
CORONAL LOOPS
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330
CORRELATION
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
CORROSION
The application of expert systems to corrosion problems
[AERE-M-3445] N85-21316
Electrochemical cell to measure corrosion rates in noncondensing environments
[DE85-003148] N85-21338
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366
Evaluation of corrosion-erosion behavior of various ceramic materials
[AD-A149756] N85-21367
Steam generator tube vibration tests
[DE85-003599] N85-21712
CORROSION RESISTANCE
Progress on transparent yttria
[AD-P004370] N85-21464
Carbon granule probe microphone for leak detection — recovery boilers
[NASA-CASE-NPO-16027-1] N85-21597
CORROSION TESTS
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260
COSMIC DUST
Survey of probable micrometer-sized Earth-orbital debris fragments in the NASA-JSC cosmic dust sample collection N85-21203
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
COSMIC PLASMA
Plasma Astrophysics — conference
[ESA-SP-207] N85-22270
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271
X-ray astronomy and plasma astrophysics N85-22288
Explosive transverse electric field and particle acceleration during magnetic collapse — cosmic plasma N85-22292
Nonlinear evolution of astrophysical Alfven waves N85-22294
Plasma in the clusters of galaxies N85-22299
Plasma processes in Herbig-Haro objects N85-22301
COSMIC RAYS
Cosmic ray generation by plasma turbulence: Development of a new paradigm in physics N85-22286
Cosmic ray composition and origin N85-22287
Self-similar modified shock structures — cosmic rays N85-22290
Solar-geophysical data number 483. November 1984. Part 1: (Prompt reports). Data for October 1984, September 1984 and late data
[PB85-147692] N85-22335
Research in particles and fields
[NASA-CR-175472] N85-22337
COSMOLOGY
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271
COSMOS 936 SATELLITE
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
COSMOS 1129 SATELLITE
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
COST ANALYSIS
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
COST EFFECTIVENESS
Polymer intermediates from limonene (follow-up project)
[BMFT-FB-T-84-243] N85-21380
RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21898
COST ESTIMATES
An agenda for a study of government science policy
[GPO-40-860] N85-22245
COST REDUCTION
Photovoltaic solar components N85-21782
President's private sector survey on cost control, report on research and development
[PB84-173269] N85-22253
COULOMETERS
State-of-charge coulometer
[NASA-CASE-NPO-15759-1] N85-21596
COUNTERMEASURES
Dual band radome wall design
[AD-P004357] N85-21451
COUPLING
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286
A study of coupling the boundary and finite element methods in two-dimensional elastostatics
[AD-A149619] N85-21702
COUPLINGS
Connection system — insuring against loss of a tool component without using multiple tethers
[NASA-CASE-MSC-20319-1] N85-21649
Normal coordinate monolithic crystal filter
[AD-D011496] N85-22188
COVARIANCE
Tests of fit based on normalized spacings
[AD-A149749] N85-22062
Asymptotics for configural estimators
[AD-A150106] N85-22087
COVERINGS
NBS solar collector durability/reliability test program
[DE85-003489] N85-21801
CRACK INITIATION
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V — titanium alloy
[DGT-25369-PT-1] N85-21341
CRACK PROPAGATION
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity
[NASA-CR-174872] N85-21685
Interaction of part-through cracks in a flat plate
[NASA-CR-175588] N85-21692
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-408] N85-21699
Fracture analysis of cracks in complete cylindrical shells
[AD-A150091] N85-21711
Fracture toughness of materials
[DE85-004306] N85-21713
Numerical simulation of static and dynamic shadow patterns using an atomistic description of crack initiation and propagation
[DE85-003226] N85-21715
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11289] N85-21721
CRACKING (FRACTURING)
Stress-relieving interlayers for bituminous resurfacings
[PB85-136885] N85-21415
CRACKS
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes
[AD-D011554] N85-21603
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
Interaction of part-through cracks in a flat plate
[NASA-CR-175588] N85-21692
Moving nonlocal crack: Anti-plane shear case
[AD-A149996] N85-21709
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11289] N85-21721
CRASHES
Annual review of aircraft accident data: US air carrier operations calendar year 1981
[NTSB/ARC-85/01] N85-21134
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
CREEP PROPERTIES
Accelerated viscoelastic characterization of T300-5208 graphite-epoxy laminates
[NASA-CR-3871] N85-21271
Multiaxial stress response of ceramics
[DE85-004350] N85-21379
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409
CREEP STRENGTH
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Alloys based on NiAl for high temperature applications
[NASA-TM-86976] N85-21322
Investigation of the development possibilities of a ferritic creep and oxidation-resistant steel for application under creep conditions above 650 deg C
[BMFT-FB-T-84-244] N85-21344
CREW STATIONS
Proceedings of the 6th Advanced Aircrew Display Symposium
[AD-A150044] N85-21180
CRITERIA
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838
CRITICAL EXPERIMENTS
Drag-free satellite simulator
[REPT-615] N85-21229
CROP GROWTH
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
CROP INVENTORIES
Remote sensing research for agricultural applications — San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho
[E85-10090] N85-21752
CROPS
Thematic Mapper spectral dimensionality and data structure N85-21736
CROSS CORRELATION
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846
CROSSLINKING
Chemical approach for controlling nadimide cure temperature and rate
[NASA-CASE-LEW-13770-5] N85-21352
CRUDE OIL
Diesel fuel alternatives for engines in civil works prime movers
[AD-A149738] N85-21400
CRUISE MISSILES
Evaluation of air and ground launched cruise missile navigational element containers
[AD-A149654] N85-21138

CRYOGENIC EQUIPMENT
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636
CRYOGENIC MAGNETS
MFTF sensor verification computer program
[DE85-004452] N85-22029
CRYOGENIC WIND TUNNELS
Exploratory flutter test in a cryogenic wind tunnel
[NASA-TM-86380] N85-21689
CRYOGENICS
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
Electrical performance of semiconductor devices at cryogenic temperatures N85-22239
CRYOSTATS
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
Superconducting magnet technology for accelerators
[DE85-004192] N85-22102
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
CRYSTAL DEFECTS
International Conference on Defects in Insulating Crystals
[AD-A149611] N85-22180
CRYSTAL DISLOCATIONS
The role of dislocations in ultrasonic attenuation
[AERE-R-11384] N85-21317
CRYSTAL FILTERS
Quartz filter transceiver N85-21538
Normal coordinate monolithic crystal filter
[AD-D011496] N85-22188
CRYSTAL GROWTH
A computer simulation of thin film nucleation and growth: The Volmer-Weber case
[NASA-TM-86068] N85-21264
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145
Nucleation of phase transitions in the vicinity of phase boundary. Part 1: Comparison of various idolated mechanisms. Part 2: Coupled cluster growth processes
[N-0208-5858] N85-22174
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
Total immersion crystal growth
[NASA-CASE-NPO-15800-2] N85-22178
CRYSTAL LATTICES
Solid electrolytes: Mechanisms for achieving optimal conductivity
[AD-A150116] N85-21296
CRYSTAL OSCILLATORS
SAW oscillator with digital compensation for the temperature related frequency changes
[AD-D011537] N85-21500
CRYSTAL STRUCTURE
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2
[AD-A150131] N85-22187
CRYSTALLINITY
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179
CRYSTALLITES
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries
[DE85-004598] N85-22201
CRYSTALLIZATION
Total immersion crystal growth
[NASA-CASE-NPO-15800-2] N85-22178
CRYSTALLOGRAPHY
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616
CRYSTALS
International Conference on Defects in Insulating Crystals
[AD-A149611] N85-22180
Electron image simulation: A complementary processing technique
[DE85-000685] N85-22190
CUMULUS CLOUDS
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902
CURING
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-4] N85-21351
Metal (11) 4,4',4',4''-phthalocyanine tetraamines as curing agents for epoxy resins
[NASA-CASE-ARC-11424-1] N85-21361
SRM filament wound case resin characterization studies N85-22212
CURRENT DISTRIBUTION
Mathematical simulation of thermal processes involved in electron-beam treatment N85-21565
CURVATURE
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
CUTTERS
Technological and economic assessment of advanced ceramic materials. Volume 4: A case study of integrated optic devices
[PB85-113116] N85-21385
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools
[PB85-113132] N85-21387
CYCLIC COMPOUNDS
Research on microemulsions for storage and conversion of solar energy
[DE85-000181] N85-21607
CYCLIC LOADS
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution
[NASA-TM-86913] N85-21690
CYCLONES
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
Studies of the development of cyclones over Southern China coastal areas and adjacent seas
[AD-A150108] N85-21901
CYCLOTRON RESONANCE DEVICES
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304
The 60 GHz gyrotron development program
[DE85-000599] N85-21522
CYLINDERS
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples
[AERE-R-10549] N85-22173
CYLINDRICAL BODIES
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559
Pneumatic clamping device
[AD-D011544] N85-21656
CYLINDRICAL SHELLS
Fracture analysis of cracks in complete cylindrical shells
[AD-A150091] N85-21711
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238

D

DAMAGE
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
DAMAGE ASSESSMENT
History of satellite break-ups in space N85-21190
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22089
DAMPING
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
DATA ACQUISITION
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
Building a functional, integrated GIS/remote sensing resource analysis and planning system — Utah
[E85-10092] N85-21754
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117964] N85-21869
Collection and use of lightning strike data in the western US during summer 1983
[PB85-110534] N85-21907
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145
Analyses via automated mass spectrometry (MS/DS) N85-22227
DATA BASE MANAGEMENT SYSTEMS
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation
[DE85-001742] N85-21621
Computer and communications security and privacy
[GPO-39-741] N85-21994
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
Using a data base management system for modelling SSME test history data N85-22211
The intelligent database machine N85-22242
Requirements for a database management system
[DE85-004661] N85-22259
DATA BASES
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Base communications issues for the 1980s
[AD-A149764] N85-21474
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856
Atlas of relectance patterns for uniform earth and cloud surfaces (NIMBUS-7ERB-61 days)
[PB85-116382] N85-21870
A new NASA/MSFC mission analysis global cloud cover data base
[NASA-TP-2448] N85-21878
A review of fatality, impairment of consciousness, and head/neck injury on USAF ejections 1971 - July 1983 N85-21974
Variable data base generator apparatus
[AD-D011515] N85-21993
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260
DATA CORRELATION
TM geometric performance: Line to Line Displacement Analysis (LLDA) — New Mexico N85-21732
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
DATA LINKS
The evolution of methods of air traffic control
[AD-A149606] N85-21137
DATA MANAGEMENT
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 2: Program documentation, version 1.0
[PB85-116069] N85-21310
DATA PROCESSING
Base communications issues for the 1980s
[AD-A149764] N85-21474
Universal file processing program for field programmable integrated circuits
[DE85-004384] N85-21526
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-80599] N85-21609
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation
[DE85-001742] N85-21621
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742
DATA PROCESSING EQUIPMENT
New types of power supplies for ultrasonic processing equipment N85-21566

RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21998
Instrumentation award
[AD-A150081] N85-21999
DATA REDUCTION
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
Main component method used to study variations of cardiovascular parameters N85-21939
DATA SAMPLING
Main component method used to study variations of cardiovascular parameters N85-21939
DATA STORAGE
RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21998
The intelligent database machine N85-22242
DATA TRANSMISSION
L.F. RADIO-DATA: Specification of BBC phase-modulated transmissions on long-wave
[BBC-RD-1984/19] N85-21431
The 20:16 block code for digital recording and transmission channels
[BBC-RD-1985/1] N85-21443
The intelligent database machine N85-22242
DECISION MAKING
The effect of jamming/deception on decision making
[AD-A149740] N85-21472
Automatic pickup of trajectory by method of sequential analysis taking into account deviation of radar markers from center of strobe N85-21535
Report on the Second Annual Review Meeting of the National Acid Precipitation Assessment Program. Research to assist decisionmaking: Summary
[DE85-003003] N85-21820
Choice reaction time and color: An annotated bibliography
[AD-A149722] N85-21979
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
A statistical approach to vendor selection
[AD-A149781] N85-22249
Task influences in the analytic-intuitive approach to decision making
[AD-A149870] N85-22250
Problems in decentralized decision making and computation
[AD-A150025] N85-22251
DECODING
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504
DECOUPLING
Practical considerations for noninteracting control synthesis
[AD-A150130] N85-22046
DEFECTS
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Reliability of structural brittle materials N85-22222
DEFLECTION
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor
[AD-A150111] N85-21295
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays
[PB85-129641] N85-21767
DEFLECTORS
Flameholder with integrated air mixer
[AD-D011549] N85-21161
DEFORMATION
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149969] N85-21665
Fracture toughness of materials
[DE85-004306] N85-21713
Summary of recent research on mechanical behavior of polycrystalline solids
[DE85-004601] N85-22199
DEGRADATION
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
DEGREES OF FREEDOM
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
DELTA WINGS
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423
DENSIMETERS
X-ray gauge measures areal density variations as small as 0.1%
[DE85-003774] N85-21629
DENSITY (MASS/VOLUME)
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Simple EOS for the silicone rubber Sylgard 184
[DE85-001394] N85-21376
Models of the upper atmosphere N85-22217
DENSITY MEASUREMENT
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
DEPLOYMENT
Integrated paratroop door
[AD-D011507] N85-21148
DEPOLARIZATION
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
DEPOSITION
Low temperature deposition of nickel films
[AD-D011568] N85-21319
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
Hazardous air pollutants: Dry-deposition phenomena
[PB85-138279] N85-21843
DEPOSITS
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
DESIGN ANALYSIS
Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467
The 13.9 GHz radiometer design
[AD-A149637] N85-21613
Reliability of structural brittle materials N85-22222
DESORPTION
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive
[NASA-CR-175565] N85-21242
DETECTION
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor
[AD-A150111] N85-21295
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride
[NASA-TM-86945] N85-21674
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11280] N85-21721
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
Focal plane array optical proximity sensor
[NASA-CASE-NPO-15155-1] N85-22139
DETECTORS
Leak detectors for organic Rankine cycle power plants: On-line and manual methods
[DE85-002792] N85-21617
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266
DETERIORATION
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
DETONATION
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
DETONATION WAVES
Waveform control and application of detonation wave in explosives N85-21420
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149825] N85-21581
DETONATORS
High-temperature-stable detonators
[DE85-005188] N85-21402
Nonprimary-explosive, hot-wire detonator
[DE85-005195] N85-21403
DEUTERIUM
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
DEVICES
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996
DIAMINES
Process for preparing highly optically transparent-colorless armomatic polyimide film
[NASA-CASE-LAR-13351-1] N85-21360
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes
[NASA-CASE-ARC-11512-2] N85-21362
Polymer intermediates from limonene (follow-up project)
[BMFT-FB-T-84-243] N85-21380
DIAMONDS
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
Sound velocity of carbon at high pressures
[DE85-002016] N85-22113
DICTIONARIES
Glossary of the soil sciences
[PB85-133452] N85-22263
DIELECTRIC PROPERTIES
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
DIELECTRICS
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
Program plan for research and development of dielectric materials for electric power systems
[DE85-001327] N85-21520
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528
Computer simulation of equipment and processes involved in high-frequency heating of dielectrics N85-21555
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559
DIESEL ENGINES
Diesel fuel alternatives for engines in civil works prime movers
[AD-A149738] N85-21400
DIESEL FUELS
Diesel fuel alternatives for engines in civil works prime movers
[AD-A149738] N85-21400
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21998
DIFFERENTIAL EQUATIONS
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
[NASA-TM-83590] N85-21162

The performance of a type-insensitive Runge-Kutta code on a personal computer
[TUM-I8410] N85-22048
Differentiating matrices for arbitrarily spaced grid points
[NASA-CR-172558] N85-22051
Nonlinear partial differential equations and related problems of Pade approximations
[AD-A149850] N85-22059
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072
Singular asymptotic expansions in nonlinear rotordynamics N85-22218
New results on the PLL false lock phenomenon N85-22236

DIFFERENTIAL GEOMETRY
A deformation analysis of flat flexible gear and its equation of original curved surfaces
[NASA-TM-77493] N85-21660

DIFFRACTION
High resolution diffraction grating
[AD-D011541] N85-22141
Switchable zero order diffraction gratings as light valves
[AD-A150129] N85-22153

DIFFUSION
Solid electrolytes: Mechanisms for achieving optimal conductivity
[AD-A150116] N85-21296
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149825] N85-21581
Time and space variability of turbulent concentration fluctuations
[AD-A149963] N85-21898
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193

DIFFUSION COEFFICIENT
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301

DIFFUSION THEORY
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005138] N85-22124

DIGITAL COMPUTERS
Multicomputer communication system
[NASA-CASE-NPO-15433-1] N85-21428
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024

DIGITAL DATA
Digital channel efficiency model
[AD-A150084] N85-21479
A preliminary assessment of LANDSAT-4 Thematic Mapper data --- Windsor, Ontario and Medicine Hat areas, Canada N85-21728
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730

DIGITAL FILTERS
Digital coherent detector
[AD-D011560] N85-21501
Estimating algorithmic error of digital recursive filters N85-21543
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
Method of designing digital band-pass filters with infinite memory N85-21546
Digital detector of harmonic signals N85-21549

DIGITAL SIMULATION
Application of model following control and estimation techniques to attitude control of maneuvering spacecraft. Part 2: Simulation software description
[NLR-TR-82116-U-PT-2] N85-21254

DIGITAL SYSTEMS
Integrated control system engineering support
[AD-A149742] N85-21177
Low sidelobe phased array antenna system
[AD-D011558] N85-21435
Television animation store: Digital chroma, key and mixer units
[BBC-RD-1984/16] N85-21442
The study of certain aspects of probability with applications in communications theory
[AD-A149820] N85-21476
Digital coherent detector
[AD-D011560] N85-21501
Digital detector of harmonic signals N85-21549
Synthesis of digital control for object with lag N85-21562
SIMULA: Digital controller simulation package
[PB85-134492] N85-22041

DIGITAL TECHNIQUES
Semianalytic modeling of aerodynamic shapes
[NASA-TP-2413] N85-21120
Estimation of the impulse response of television channels from digitized waveforms
[CRC-1376] N85-21429
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-80599] N85-21609

DIGITAL TO ANALOG CONVERTERS
Electrical characterization of analog microprocessors
[AD-A149629] N85-21995

DIISOCYANATES
Polymer intermediates from limonene (follow-up project)
[BMFT-FB-T-84-243] N85-21380

DIPOLE ANTENNAS
Printed circuit balun with a dipole antenna
[AD-D011534] N85-21498

DIRECT CURRENT
Study of electric field and ion effects on HVDC lines
[DE85-002975] N85-21503
Ultrasensitive measuring devices
[DE85-000672] N85-21622
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160

DIRECTIONAL SOLIDIFICATION (CRYSTALS)
Crystallization methods for solar cell silicon N85-21774

DISASTERS
Hurricane storm surge research
[GPO-40-048] N85-21880

DISCONNECT DEVICES
Releasable cable connector assembly for use between a mobile and stationary object
[AD-D011538] N85-21655

DISCONTINUITY
Recovering pointwise values of discontinuous data within spectral accuracy
[NASA-CR-172535] N85-22049

DISCOVERY (ORBITER)
Results of Space Shuttle flight 41-D
[GPO-39-481] N85-21243

DISCRIMINANT ANALYSIS (STATISTICS)
Discriminant analysis of pulsar groups in the diagram P versus P N85-22319

DISEASES
Review of US manual of clinical aviation medicine N85-21957

DISK GALAXIES
On the morphology of spiral modes --- disk galaxies N85-22283
Drift-accretion theory of the spiral structure of galaxies N85-22298

DISORDERS
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936

DISPERSING
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399

DISPLACEMENT
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration
[DE85-000467] N85-21618
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-406] N85-21701
On the relative motion of typhoons: In the case of Typhoon 8305 and Typhoons 8306 and 8307 N85-21885

DISPLAY DEVICES
Proceedings of the 6th Advanced Aircrew Display Symposium
[AD-A150044] N85-21160
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
Design issues in video disc map display
[AD-A149646] N85-21760
Choice reaction time and color: An annotated bibliography
[AD-A149722] N85-21979
Implementation of the computer program-system MOSS (Map Overlay and Statistical System) on a VAX-11 series computer under VMS
[AD-A149612] N85-22019
Design of graphic displays in computerized systems
[AD-A150071] N85-22027
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149680] N85-22143

DISSOCIATION
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149813] N85-21291

DISTANCE
Distance-inertial guidance of launch vehicle described N85-21417

DISTORTION
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744

DISTRIBUTED PROCESSING
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision
[AD-A149997] N85-22068

DISTRIBUTION (PROPERTY)
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559

DISTRIBUTION FUNCTIONS
The ambiguity function and the Wigner distribution
[AD-A150095] N85-21482
On the limiting empirical distribution function of the eigenvalues of a multivariate F matrix
[AD-A149818] N85-22065

DISTRICT OF COLUMBIA
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738

DIVIDES (LANDFORMS)
Physiography of the Martian west equatorial uplift N85-22325

DIVING (UNDERWATER)
High pressure environmental conditioning systems and chamber rehabilitation
[AD-A150039] N85-21964

DOCUMENT STORAGE
Tekedit: An enhanced editor for Direct View Storage Tube (DVST) graphics display devices
[AD-A149715] N85-22021

DOCUMENTATION
Integrated control system engineering support
[AD-A149742] N85-21177
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254

DOMES
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502

DOORS
Integrated paratroop door
[AD-D011507] N85-21148

DOPED CRYSTALS
Preparation of crystal growth experiments in Spacelab: Si (FSLP), CdTe (D1), ZnS (D1)
[BMFT-FB-W-84-045] N85-21227
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193

DOPPLER EFFECT
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly
[DE85-003260] N85-21592

DOPPLER RADAR
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873

DRAG
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881

DRAG CHUTES
Extended moment arm anti-spin device
[NASA-CASE-LAR-12979-1] N85-21147

DRAG MEASUREMENT
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129

DRAG REDUCTION
Drag-free satellite simulator
[REPT-615] N85-21229
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3884] N85-21272
Investigation of the initial events in biofouling
[AD-A149995] N85-21927

DRIFT
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
DRIFT RATE
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608
DRILLING
Shallow magma targets in the western US
[DE85-003274] N85-21803
DROP SIZE
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system
[NASA-CR-174839] N85-21604
DRUGS
Review of US guide on medication and flying N85-21958
DRYING
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
DUCTS
An experimental investigation of an underexpanded rectangular jet ejector
[AD-A149656] N85-21170
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583
DUST
Theoretical and experimental investigations of dust loaded flow fields in industrial halls
[BMFT-FB-HA-84-044] N85-21411
DUST COLLECTORS
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
DYNAMIC CHARACTERISTICS
Oscillator development
[AD-A149699] N85-21509
State-selected ion-molecule reaction dynamics
[AD-A150068] N85-22115
Dynamics of space charge waves in the laser beat wave accelerator
[AD-A149688] N85-22163
Dynamics of elliptical galaxies and the r sup 1/4 luminosity law N85-22282
DYNAMIC CONTROL
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
DYNAMIC LOADS
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
DYNAMIC MODELS
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235
DYNAMIC PROGRAMMING
Programs for dynamic loading of precompiled subroutine packages, especially for applications with the Watfiv compiler
[DFVLR-MITT-84-18] N85-22035
DYNAMIC RESPONSE
Multiaxial stress response of ceramics
[DE85-004350] N85-21379
Method of designing digital band-pass filters with infinite memory N85-21546
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
Structural sensitivity analysis: Methods, applications and needs
[NASA-TM-85827] N85-21695
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
A solution method for nonlinear dynamic analysis of shell structures
[AD-A149848] N85-21708
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
DYNAMIC STRUCTURAL ANALYSIS
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
Structural sensitivity analysis: Methods, applications and needs
[NASA-TM-85827] N85-21695

E

EARTH ATMOSPHERE
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
EARTH MANTLE
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863
EARTH ORBITS
A model for the evolution of on-orbit manmade debris environment N85-21196
Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
Considerations for policy on man-made debris propagation control N85-21219
Environment definition, large particles N85-21220
Modeling N85-21221
Measurements N85-21222
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Spacecraft hazard and shielding requirements N85-21224
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories
[NASA-TM-86946] N85-21226
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
EARTH RADIATION BUDGET EXPERIMENT
Earth radiation budget experiment software development
[NASA-CR-172567] N85-22002
EARTH RESOURCES
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
EARTH SURFACE
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures — Illinois N85-21731
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326
EARTHQUAKES
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117984] N85-21869
ECOLOGY
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21829
ECONOMIC ANALYSIS
Transportation
[JPRS-UTR-85-004] N85-21105
Current development, applications of airships in USSR N85-21109
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base
[RAD-84-203-001-80-21] N85-21230
Polymer intermediates from limonene (follow-up project)
[BMFT-FB-T-84-243] N85-21380
Technological and economic assessment of advanced ceramic materials. Volume 1: Summary and conclusions
[PB85-113082] N85-21383
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671
ECONOMIC DEVELOPMENT
Systems research on China in year 2000 N85-21418
ECONOMIC FACTORS
Development of high-efficiency economic systems for photovoltaics N85-21795
ECONOMIC IMPACT
Technological and economic assessment of advanced ceramic materials. Volume 2: A case study of ceramics in heat engine applications
[PB85-113090] N85-21384
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
ECONOMICS
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806
ECOSYSTEMS
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984)
[DE85-004572] N85-21827
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21829
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
EDDY CURRENTS
Behavior of small ferromagnetic particles in traveling magnetic field N85-21564
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes
[AD-D011554] N85-21603
EDDY VISCOSITY
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
EDGE DISLOCATIONS
Fracture toughness of materials
[DE85-004306] N85-21713
EDITING
Tekedit: An enhanced editor for Direct View Storage Tube (DVST) graphics display devices
[AD-A149715] N85-22021
EDUCATION
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996
EFFERENT NERVOUS SYSTEMS
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936
EFFICIENCY
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802
Characterizing the parallelism in rule-based expert systems
[DE85-002432] N85-22047
EIGENVALUES
Modal control of structural systems
[AD-A149734] N85-21235
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693
Practical considerations for noninteracting control synthesis
[AD-A150130] N85-22046
On the limiting empirical distribution function of the eigenvalues of a multivariate F matrix
[AD-A149818] N85-22065
EIGENVECTORS
The eigenstructure assignment of deadbeat control systems
[AD-A149761] N85-21510
Practical considerations for noninteracting control synthesis
[AD-A150130] N85-22046
EINSTEIN EQUATIONS
Conserved quantities and radiative aspects of asymptotically anti-de Sitter space-times N85-22303
EJECTION INJURIES
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
A review of neck injury and impaired consciousness associated with US Navy ejections 1 January 1969 - 31 December 1979 N85-21973
A review of fatality, impairment of consciousness, and head/neck injury on USAF ejections 1971 - July 1983 N85-21974

A review of fatality, impairment of consciousness and head and neck injury on Royal Air Force ejections 1968-1981 N85-21975
The clinical and radiological assessment of cervical injury, Annex A N85-21976
Head/neck injury: Post mortem procedures, Annex B N85-21977

EJECTION SEATS
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program) [AD-A149596] N85-21158
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report [AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
Windblast arm protector assembly [AD-D011512] N85-21984

EJECTORS
An experimental investigation of an underexpanded rectangular jet ejector [AD-A149656] N85-21170

ELASTIC DEFORMATION
A deformation analysis of flat flexible gear and its equation of original curved surfaces [NASA-TM-77493] N85-21660
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution [NASA-TM-86913] N85-21690
Planar dynamics of a uniform beam with rigid bodies affixed to the ends [NASA-CR-175566] N85-21693

ELASTIC PROPERTIES
Rheology of dissemination [AD-A150006] N85-21373
Elastic response of a half-plane to a bonded interference-fit disc of the same material [ARL-STRUC-R-406] N85-21701
Moving nonlocal crack: Anti-plane shear case [AD-A149996] N85-21709

ELASTIC SCATTERING
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples [AERE-R-10549] N85-22173

ELASTIC WAVES
Characterisation of fatigue crack extension by quantitative acoustic emission [AERE-R-11289] N85-21721

ELASTODYNAMICS
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction [ONERA-1983-91] N85-21684

ELASTOMERS
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft [NASA-CASE-LAR-12775-2] N85-21349

ELASTOSTATICS
A study of coupling the boundary and finite element methods in two-dimensional elastostatics [AD-A149619] N85-21702

ELECTRIC ARCS
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes [DE85-000861] N85-21521
Characteristics of multiarc plasma devices N85-21554
Review of anode phenomena in vacuum arcs [DE85-002736] N85-22101

ELECTRIC BATTERIES
Nickel-cadmium battery cell reversal from resistive network effects [AD-A149626] N85-21505
Polymeric electrolytes for ambient temperature lithium batteries [DE85-001032] N85-21518
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries [DE85-004345] N85-21525
State-of-charge coulometer [NASA-CASE-NPO-15759-1] N85-21596

ELECTRIC COILS
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes [AD-D011554] N85-21603

ELECTRIC CONDUCTORS
Characterization of high temperature electrically conducting oxides [DE85-004296] N85-21307
The liner package: An incipient MHD capability for CCUBE [LA-9969-MS] N85-22007
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process [DE85-003212] N85-22191

ELECTRIC CONTACTS
A solution method for large deformation contact problems [AD-A149842] N85-21707

ELECTRIC CURRENT
The liner package: An incipient MHD capability for CCUBE [LA-9969-MS] N85-22007

ELECTRIC DIPOLES
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources [AD-A149638] N85-21470
Piezoelectric transducer using electrically poled gamma-phase Nylon 11 [AD-D011552] N85-21602

ELECTRIC FIELDS
Study of electric field and ion effects on HVDC lines [DE85-002975] N85-21503
An improved rocket-borne electric field meter for the middle atmosphere [NASA-CR-175510] N85-21851
Reconsideration of sheath related to negative ion extraction [IPPJ-706] N85-22159
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field [IPPJ-707] N85-22160
Dynamics of space charge waves in the laser beat wave accelerator [AD-A149688] N85-22163
Explosive transverse electric field and particle acceleration during magnetic collapse — cosmic plasma N85-22292

ELECTRIC FILTERS
Optimal discrete filtration of intricate phase-keyed signals N85-21550

ELECTRIC GENERATORS
Solar powered actuator with continuously variable auxiliary power control [NASA-CASE-MFS-25637-1] N85-21769

ELECTRIC MOTORS
Cost comparison of small gas turbines versus electric motors in a variable load industrial application [PB85-149763] N85-21530

ELECTRIC POTENTIAL
Review of anode phenomena in vacuum arcs [DE85-002736] N85-22101
Electrical performance of semiconductor devices at cryogenic temperatures N85-22239

ELECTRIC POWER PLANTS
Program plan for research and development of dielectric materials for electric power systems [DE85-001327] N85-21520
Heat Cycle Research Experimental Program report, FY-84 [DE85-003558] N85-21811

ELECTRIC POWER SUPPLIES
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base [RAD-84-203-001-80-21] N85-21230
New types of power supplies for ultrasonic processing equipment N85-21566

ELECTRIC SWITCHES
High-voltage, high-power, solid-state remote power controllers for aerospace applications [NASA-TP-2437] N85-21263
Basic studies of gases for fast switches [AD-A149828] N85-21514
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration [DE85-000467] N85-21618

ELECTRIC WIRE
Releasable cable connector assembly for use between a mobile and stationary object [AD-D011538] N85-21655
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process [DE85-003212] N85-22191

ELECTRICAL ENGINEERING
USSR report: Electronics and electrical engineering [JPRS-UEE-85-004] N85-21531

ELECTRICAL FAULTS
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces [NASA-CR-175585] N85-21250
Concurrent simulation techniques exploiting hierarchy [AD-A149783] N85-21512
Basic studies of gases for fast switches [AD-A149828] N85-21514

ELECTRICAL MEASUREMENT
Electromagnetic pulse (EMP) injection on cable entries, type ERA; EMP memo no. 10 [FOA-E-30003-A3] N85-21484
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
MFTF sensor verification computer program [DE85-004452] N85-22029

ELECTRICAL PROPERTIES
Investigation of electric and magnetic properties of intercalated graphite [AD-A149801] N85-21274
Electric and magnetic properties of intercalated graphite [AD-A149848] N85-21276
Proceedings of the Symposium on Electromagnetic Windows (17th) held at Georgia Inst. of Technology, Engineering Experiment Station, Atlanta, Georgia on 25-27 July 1984. Part 2 [AD-A149125] N85-21444
Dual band radome wall design [AD-P004357] N85-21451
Broadband thermoplastic radomes [AD-P004369] N85-21463
Development of the F-20 nose radome [AD-P004374] N85-21468

ELECTRICAL RESISTIVITY
Solid electrolytes: Mechanisms for achieving optimal conductivity [AD-A150116] N85-21296
Characterization of high temperature electrically conducting oxides [DE85-004296] N85-21307
Update of thermal conductivity and electrical resistivity of electrolytic iron, tungsten and stainless steel [PB85-115814] N85-21311
Control of electronic, magnetic and optical properties of doped polyacetylene conductors [AD-A150117] N85-21375
Fine-grained, isotropic graphite for use as NBS (National Bureau of Standards) thermophysical property RM's from 5 to 2500 K [PB85-112886] N85-21381
Research on separators for alkaline zinc batteries [DE85-003082] N85-21523
Distribution of atmospheric electric current in the global circuit [CONTRIB-87] N85-21852
The liner package: An incipient MHD capability for CCUBE [LA-9969-MS] N85-22007

ELECTRO-OPTICS
Imaging apparatus for transverse electrode electro-optic tunable filter [AD-D011524] N85-21497
USSR report: Electronics and electrical engineering [JPRS-UEE-85-004] N85-21531
Topics in optical materials and device research, 3: Volume 1 [AD-A149726] N85-22145

ELECTROACOUSTIC TRANSDUCERS
Method and apparatus for detecting acoustic emissions from metal matrix wire [AD-D011556] N85-22107

ELECTROCHEMICAL CELLS
Electrochemical cell to measure corrosion rates in noncondensing environments [DE85-003148] N85-21338

ELECTROCHEMICAL OXIDATION
Polymeric electrolytes for ambient temperature lithium batteries [DE85-001032] N85-21518

ELECTROCHEMISTRY
Electrochemistry and electrochemical methodology in molten salts [AD-A149613] N85-21284
Electrochemical processes at the sodium (BETA)" alumina interface [DE85-004653] N85-21305
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering [PB85-149789] N85-21312
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers [ARL-MAT-R-117] N85-21326
Stress corrosion cracking behavior of tungsten heavy alloys [AD-A149843] N85-21329

ELECTRODES
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288
Electrochemical processes at the sodium (BETA)" alumina interface
[DE85-004653] N85-21305
Solar-assisted hydrogen generation by photoelectrocatalysis
[PB85-149706] N85-21314
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608

ELECTROKINETICS
Circulation and internal waves in a cold Gulf Stream waves
[AD-A149704] N85-21918

ELECTROLESS DEPOSITION
Low temperature deposition of nickel films
[AD-D011568] N85-21319

ELECTROLYTES
Polymeric electrolytes for ambient temperature lithium batteries
[DE85-001032] N85-21518
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries
[DE85-004345] N85-21525

ELECTROLYTIC CELLS
State-of-charge coulometer
[NASA-CASE-NPO-15759-1] N85-21596

ELECTROMAGNETIC ABSORPTION
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627

ELECTROMAGNETIC ACCELERATION
Plasma mass and effective inductance in a small railrow
[MRL-R-947] N85-22162

ELECTROMAGNETIC COMPATIBILITY
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560

ELECTROMAGNETIC FIELDS
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources
[AD-A149638] N85-21470
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559
Characteristics of the boat inductor for keeping liquid metal in the suspended state
[NASA-TM-77816] N85-21611
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225

ELECTROMAGNETIC MEASUREMENT
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559

ELECTROMAGNETIC NOISE
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
Statistical phenomena in particle beams
[DE85-001050] N85-22118

ELECTROMAGNETIC PROPERTIES
Electromagnetic analysis of radomes by the moment method
[AD-P004351] N85-21445
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Research on ocean floor electrical surveys
[AD-A149831] N85-21920

ELECTROMAGNETIC PULSES
Electromagnetic pulse (EMP) injection on cable entries, type ERA; EMP memo no. 10
[FOA-E-30003-A3] N85-21484
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154

ELECTROMAGNETIC RADIATION
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437
Proceedings of the Symposium on Electromagnetic Windows (17th) held at Georgia Inst. of Technology, Engineering Experiment Station, Atlanta, Georgia on 25-27 July 1984. Part 2
[AD-A149125] N85-21444
Arguments for fundamental emission by the parametric process L yields T + Σ in interplanetary type III bursts — langmuir, electromagnetic, ion acoustic waves (L, T, S) N85-22311
Small scale structure and the Spinar model for active galactic nuclei N85-22316

ELECTROMAGNETIC SCATTERING
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-175507] N85-21438
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627

ELECTROMAGNETIC SHIELDING
Electromagnetic pulse (EMP) injection on cable entries, type ERA; EMP memo no. 10
[FOA-E-30003-A3] N85-21484

ELECTROMAGNETIC WAVE TRANSMISSION
Survivable propagation
[AD-A150070] N85-21478
Analysis and computations of microwave-atmospheric interactions
[AD-A149666] N85-21854

ELECTROMETERS
An improved rocket-borne electric field meter for the middle atmosphere
[NASA-CR-175510] N85-21851

ELECTRON BEAM WELDING
Mathematical simulation of thermal prrocesses involved in electron-beam treatment N85-21565

ELECTRON BEAMS
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855

ELECTRON CAPTURE
Negative lithium emission from a tungsten surface in a plasma
[DE85-003456] N85-22167

ELECTRON CYCLOTRON HEATING
The 60 GHz gyrotron development program
[DE85-000599] N85-21522

ELECTRON DENSITY PROFILES
Rocket observations of the ionosphere during the eclipse of 26 February 1979
[NASA-CR-175513] N85-21850
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859

ELECTRON DISTRIBUTION
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419

ELECTRON EMISSION
The influence of the local solar wind structures on the propagation of low energy particles N85-22314

ELECTRON ENERGY
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172

ELECTRON GUNS
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths
[DE85-000662] N85-21646

ELECTRON MICROSCOPY
Electron image simulation: A complementary processing technique
[DE85-000685] N85-22190

ELECTRON PARAMAGNETIC RESONANCE
Control of electronic, magnetic and optical properties of doped polyacetylene conductors
[AD-A150117] N85-21375

ELECTRON PHONON INTERACTIONS
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals
[AD-A149760] N85-21290

ELECTRON SCATTERING
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals
[AD-A149760] N85-21290
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126

ELECTRON SPECTROSCOPY
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220

ELECTRON TUNNELING
Inelastic tunnel diodes
[NASA-CASE-LEW-13833-1] N85-21492
Thin film technology of high-critical-temperature superconducting electronics
[AD-A150010] N85-22185

ELECTRONIC EQUIPMENT
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
Nose and inlet duct radomes for the firebolt aerial target
[AD-P004375] N85-21469
Maintainability time standards for electronic equipment
[AD-A149684] N85-21507
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
The future of lightwave technology
[PB85-109759] N85-22155

ELECTRONIC EQUIPMENT TESTS
Design of a bit-sliced processor array with built-in-self-test
[AD-A149785] N85-21513
Built-in tests for VLSI (Very Large Scale Integration) finite-state machines
[AD-A149784] N85-21997

ELECTRONIC TRANSDUCERS
Electromagnetic Acoustic Transducers (EMATs) for erosion monitoring
[DE85-004834] N85-21628
MFTF sensor verification computer program
[DE85-004452] N85-22029

ELECTRONS
Velocity distributions of solar wind ions and electrons N85-22273
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297

ELECTROSLAG PROCESS
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409

ELECTROSTATIC CHARGE
Electrostatic potentials: A new method for interpreting and predicting molecular reactivities and for designing synthetic pathways. Applications to nitroaromatics, nitramines and nitrated
[AD-A150120] N85-21298

ELECTROSTATIC GYROSCOPES
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608

ELECTROSTATIC WAVES
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004566] N85-22171
Cosmic ray generation by plasma turbulence: Development of a new paradigm in physics N85-22286

ELECTROSTATICS
Electrostatic confinement in a bumpy torus
[DE85-003794] N85-22164

ELECTROTHERMAL ENGINES
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260

ELEMENTARY PARTICLES
Cosmology, galactic astronomy and elementary particle physics N85-22289

ELEVATION ANGLE
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149687] N85-21614

ELLIPTIC DIFFERENTIAL EQUATIONS
On the accuracy of least squares methods in the presence of corner singularities
[NASA-CR-172552] N85-22050

ELLIPTICAL GALAXIES
Dynamics of elliptical galaxies and the r sup 1/4 luminosity law N85-22282

ELONGATION
Rheology of dissemination
[AD-A150006] N85-21373

EMBRITTLEMENT
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334

EMISSION SPECTRA
Formation of optical-line emitting regions in the jets of SS433 N85-22318

EMISSIVITY
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report
[DE85-003715] N85-22169

EMULSIONS
A study of organic chemical reactions in microemulsions
[AD-A150083] N85-21265
A brief review of the technology of microemulsions and other micellar systems
[AD-A149759] N85-21269
Research on microemulsions for storage and conversion of solar energy
[DE85-000181] N85-21807

ENERGETIC PARTICLES
An atlas of polar cap energetic particle observations. Volume 2: NOAA-6, 8 July 1979 to 10 May 1983
[PB85-109072] N85-21868
Suppression of tilting instability of a compact torus by energetic particle beams
[IPPJ-705] N85-22157
Particle transport in planetary magnetospheres N85-22275

ENERGY ABSORPTION
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149969] N85-21665
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119

ENERGY ABSORPTION FILMS
International Congress Centrum Berlin report on photovoltaics N85-21773
Thin-film solar cells from sputtered and vapor-deposited amorphous silicon N85-21792
Development of a CdSe thin film solar cell N85-21796

ENERGY BANDS
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183

ENERGY CONSERVATION
Power from the Sun: Light at night
[PB85-124097] N85-21614

ENERGY CONVERSION
Oceanic role in terrestrial climate
[DE85-004422] N85-21904

ENERGY CONVERSION EFFICIENCY
Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785
Development of high-efficiency economic systems for photovoltaics N85-21795

ENERGY DISSIPATION
Reducing electric power losses in discharge chamber of induction plasmatron N85-21553
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861

ENERGY POLICY
International Congress Centrum Berlin report on photovoltaics N85-21773
Crystallization methods for solar cell silicon N85-21774
Pin solar cells made of amorphous silicon N85-21787
Physical-chemical investigations of copper sulfides for use in CdS/Cu2S solar cells N85-21794
Development of a CdSe thin film solar cell N85-21796
Solar process heat: Technology program
[BMFT-FB-T-84-234] N85-21812

ENERGY SPECTRA
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119
On the spectrum of longitudinal waves in the hot degenerate plasma N85-22280

ENERGY STORAGE
Power circuit utilizing self-excited Hall effect switch means
[AD-D011505] N85-21496
Research on microemulsions for storage and conversion of solar energy
[DE85-000181] N85-21807
Evaluation of ettringite and related compounds for use in solar energy storage
[DE85-003249] N85-21809
Evaluation of ettringite and related compounds for use in solar energy storage
[PB85-146876] N85-21816

ENERGY TECHNOLOGY
Materials refining for solar cell silicon N85-21775
Flat-plate silicon for solar cells N85-21776
Carbothermic production of silicon solar cells using high-purity starting materials N85-21777
Development of silicon nitride materials for the casting of solar cell silicon N85-21779
Photovoltaic roofing tile systems N85-21783
Optimization of silicon-nitride-inversion layer solar cells N85-21784
Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785
Development of new solar cells N85-21797
Multi-year plan for Experimental Systems Research: Passive and hybrid solar energy program
[DE85-004696] N85-21810
Solar process heat: Technology program
[BMFT-FB-T-84-234] N85-21812

ENERGY TRANSFER
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292

ENGINE DESIGN
Lubrication and performance of high-speed rolling-element bearings
[NASA-TM-86958] N85-21658
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802

ENGINE FAILURE
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3678] N85-21117

ENGINE INLETS
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122

ENGINE PARTS
Tribological systems as applied to aircraft engines
[NASA-TM-86965] N85-21657

ENGINEERING
Computational mechanics: A perspective on problems and opportunities for increasing productivity and quality of engineering
[PB85-128106] N85-22252

ENGINES
Technological and economic assessment of advanced ceramic materials. Volume 2: A case study of ceramics in heat engine applications
[PB85-113090] N85-21384

ENTHALPY
Evaluation of ettringite and related compounds for use in solar energy storage
[DE85-003249] N85-21809

ENVIRONMENT EFFECTS
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984)
[DE85-004572] N85-21827
Assessment of hazardous waste surface impoundment technology case studies and perspectives of experts
[PB85-117059] N85-21834
Standard analytical procedures of the NOAA National Analytical Facility, 1984-85: Extractable toxic organic compounds
[PB85-126282] N85-21840
Summary report of the Workshop on Structure Activity Concepts in Environmental Sciences
[PB85-137339] N85-21841
Impact of aerosols on visibility and climate: A report prepared for Panel 3, Environmental Impact, of the NATO/CCMS Air Pollution Pilot Study on Air Pollution Control Strategies and Impact Modelling
[PB85-106744] N85-21906
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948

ENVIRONMENT MODELS
Measurements N85-21222
The accuracy in calculations of intervisibility with digital terrain models — digital models
[FOA-C-20557-D6(E1)] N85-21983

ENVIRONMENT POLLUTION
Report on the Second Annual Review Meeting of the National Acid Precipitation Assessment Program. Research to assist decisionmaking: Summary
[DE85-003003] N85-21820

ENVIRONMENTAL CHEMISTRY
Summary report of the Workshop on Structure Activity Concepts in Environmental Sciences
[PB85-137339] N85-21841

ENVIRONMENTAL MONITORING
On the P1 data from GMS-SEM N85-21890
The development of image processing of NOAA AVHRR data and its application to sea surface temperature N85-21891

ENVIRONMENTAL TESTS
Evaluation of corrosion-erosion behavior of various ceramic materials
[AD-A149756] N85-21367
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626

ENZYMES
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951

EOSS
In situ orbital debris experiment concepts N85-21198

EPINEPHRINE
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944

EPITAXY
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193
Technology of thin silicon foils for the fabrication of monolithic integrated sensors
[BMFT-FB-T-84-209] N85-22202

EPOXY COMPOUNDS
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108843] N85-21412

EPOXY MATRIX COMPOSITES
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data
[AD-A149810] N85-21275

EPOXY RESINS
Rubber modified epoxy adhesive
[AD-D011527] N85-21354
Metal (11) 4,4',4',4''-phthalocyanine tetraamines as curing agents for epoxy resins
[NASA-CASE-ARC-11424-1] N85-21361
SRM filament wound case resin characterization studies N85-22212

EQUATIONS OF MOTION
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313

EQUATIONS OF STATE
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
Simple EOS for the silicone rubber Sylgard 184
[DE85-001394] N85-21376
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419
Control of nonlinear objects N85-21561
Synthesis of digital control for object with lag N85-21562

EQUILIBRIUM FLOW
Computer-Aided Structural Engineering (CASE) project. Seepage analysis of confined flow problems by the method of fragments (CFRAG)
[AD-A150015] N85-21762

ERGODIC PROCESS
On ergodic actions whose self-joinings are graphs
[CWI-PM-R8408] N85-22093

ERROR ANALYSIS
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
Estimating algorithmic error of digital recursive filters N85-21543
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements
[PB85-128148] N85-22265

ERROR CORRECTING CODES
Redundancy of codes for detection and correction of unidirectional errors N85-21557
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001

ERROR DETECTION CODES
The 20:16 block code for digital recording and transmission channels
[BBC-RD-1985/1] N85-21443
Redundancy of codes for detection and correction of unidirectional errors N85-21557
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001
ESCHERICHIA
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
ESTERS
Plasticizer system for propellant compositions
[AD-D011514] N85-21393
Plasticizer system for propellant compositions
[AD-D011516] N85-21394
Plasticizer system for propellant compositions
[AD-D011517] N85-21395
ESTIMATES
AFOS (Automation of Field Operations and Services)-ERA forecast verification, September 1984
[PB85-137578] N85-21912
An asymptotically efficient solution to the bandwidth problem of kernel density estimation, revision
[AD-A149600] N85-22056
ESTIMATORS
Asymptotics for configural estimators
[AD-A150106] N85-22087
ETHANE
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
ETHERS
Plasticizer system for propellant compositions
[AD-D011508] N85-21391
Azido nitramino ether containing solid propellants
[AD-D011511] N85-21392
Plasticizer system for propellant compositions
[AD-D011516] N85-21394
ETHYL ALCOHOL
Developments in the production and use of ethanol fuels
[GPO-40-678] N85-21398
ETHYLENE OXIDE
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
EULER EQUATIONS OF MOTION
A convergent series expansion for hyperbolic systems of conservation laws
[NASA-CR-172557] N85-21990
EULER-LAGRANGE EQUATION
Adaptive meshes in the 2DL code
[LA-9938-MS] N85-22011
EUROPE
An air-breathing ballistic space transporter for Europe
[NASA-TM-77645] N85-21244
EVALUATION
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
Electrical characterization of analog microprocessors
[AD-A149629] N85-21995
EVAPORATION
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825
EVAPORATIVE COOLING
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010813] N85-21798
EVENTS
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
EVOLUTION (DEVELOPMENT)
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326
EXHAUST EMISSION
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21832
EXHAUST FLOW SIMULATION
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171
EXHAUST SYSTEMS
Pneumatic clamping device
[AD-D011544] N85-21656
EXHAUST VELOCITY
Particle size, number, composition and velocity from solid rocket motors N85-21201
EXOBIOLOGY
Modular plant culture systems for life support functions
[NASA-CR-171853] N85-21924
EXOTHERMIC REACTIONS
Theoretical studies on N-bonded pyrazole derivatives of boron
[AD-A150036] N85-21374
EXPENDABLE STAGES (SPACECRAFT)
Commercial space launches
[S-REPT-98-656] N85-21225
EXPERIMENT DESIGN
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980
EXPERT SYSTEMS
The application of expert systems to corrosion problems
[AERE-M-3445] N85-21316
An interactive environment for the development of an expert system in ZOG
[AD-A149954] N85-22025
Characterizing the parallelism in rule-based expert systems
[DE85-002432] N85-22047
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
Evaluation of expert systems N85-22229
EXPLODING WIRES
Nonprimary-explosive, hot-wire detonator
[DE85-005195] N85-21403
EXPLORATION
Workshop on Remote Sensing/Lineament Applications for Energy Extraction
[DE84-009291] N85-21763
EXPLORER 10 SATELLITE
Discovery of the solar wind N85-22272
EXPLORER 46 SATELLITE
Impacts on Explorer 46 from an Earth orbiting population N85-21204
EXPLOSIONS
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856
Biological effects of blast and impact waves
[FOA-C-52006-H4-D7] N85-21968
Adaptive meshes in the 2DL code
[LA-9938-MS] N85-22011
EXPLOSIVES
Waveform control and application of detonation wave in explosives N85-21420
EXPOSURE
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
EXTINCTION
On the inversion of the lidar equation
[AD-A149653] N85-21641
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths
[NASA-TM-86379] N85-21874
EXTRAGALACTIC RADIO SOURCES
Jets in galaxies N85-22309
EXTRAPOLATION
Proposed preliminary design criteria model environment for the 1990's N85-21194
EXTRATERRESTRIAL ENVIRONMENTS
Natural environment design criteria for the Space Station definition and preliminary design
[NASA-TM-86498] N85-21232
EXTRATERRESTRIAL RADIATION
Research in particles and fields
[NASA-CR-175472] N85-22337
EXTREMELY HIGH FREQUENCIES
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
EXTREMELY LOW RADIO FREQUENCIES
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources
[AD-A149638] N85-21470
EYE (ANATOMY)
Retinal information mapping system
[AD-D011531] N85-21601
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967
Technical support for microwave experiments on the eye lens
[AD-A149702] N85-22144

F

F-14 AIRCRAFT
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
F-15 AIRCRAFT
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile
[NASA-TM-85904] N85-21245
F-16 AIRCRAFT
Automated radome testing
[AD-P004362] N85-21458
F-111 AIRCRAFT
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products
[AD-A149777] N85-21368
FABRICATION
Research on separators for alkaline zinc batteries
[DE85-003082] N85-21523
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616
FABRICS
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
FACILITIES
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366
FAILURE
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22089
FAILURE ANALYSIS
Environment definition, large particles N85-21220
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems
[DE84-004521] N85-21770
FAILURE MODES
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends
[NASA-TM-86355] N85-21270
Supported liquid membrane battery separators
[DE85-001031] N85-21519
FARMLANDS
Remote sensing research for agricultural applications --- San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho
[E85-10090] N85-21752
FASTENERS
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes
[AD-D011554] N85-21603
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-409] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-408] N85-21701
FATIGUE (MATERIALS)
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-406] N85-21699
Proceedings of the 9th Biennial Army Symposium on Solid Mechanics. Advances in Solid Mechanics for Design and Analysis
[AD-A150042] N85-21710
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11289] N85-21721

FATIGUE LIFE
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
FATIGUE TESTS
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends
[NASA-TM-86355] N85-21270
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V — titanium alloy
[DGT-25369-PT-1] N85-21341
FEASIBILITY ANALYSIS
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base
[RAD-84-203-001-80-21] N85-21230
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools
[PB85-113132] N85-21387
Shallow magma targets in the western US
[DE85-003274] N85-21803
Using a data base management system for modelling SSME test history data N85-22211
FEDERAL BUDGETS
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy
[GPO-41-060] N85-22244
An agenda for a study of government science policy
[GPO-40-860] N85-22245
President's private sector survey on cost control, report on research and development
[PB84-173269] N85-22253
Summary of activities of the Committee on Science and Technology
[H-REPT-98-1189] N85-22341
FEEDBACK
The eigenstructure assignment of deadbeat control systems
[AD-A149761] N85-21510
FEEDBACK CONTROL
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154
Modal control of structural systems
[AD-A149734] N85-21235
Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
NASA/MSFC ground experiment for large space structure control verification
[NASA-TM-86496] N85-21248
The eigenstructure assignment of deadbeat control systems
[AD-A149761] N85-21510
Control of nonlinear objects N85-21561
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
Practical considerations for noninteracting control synthesis
[AD-A150130] N85-22046
FEET (ANATOMY)
Translating rudder pedal system
[AD-D011510] N85-21172
FERMI-DIRAC STATISTICS
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419
FERMIONS
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194
FERRITES
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359
FERRITIC STAINLESS STEELS
Investigation of the development possibilities of a ferritic creep and oxidation-resistant steel for application under creep conditions above 650 deg C
[BMFT-FB-T-84-244] N85-21344
FERROMAGNETIC MATERIALS
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195
FERROMAGNETISM
Investigation of electric and magnetic properties of intercalated graphite
[AD-A149801] N85-21274
Magnetic X-ray scattering studies of the rare Earth metal holmium
[DE85-003606] N85-21335
Behavior of small ferromagnetic particles in traveling magnetic field N85-21564
Paramagnetic scattering from Ni
[DE85-004207] N85-22198
FERTILIZATION
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
FIBER OPTICS
Wide-field-of-view, helmet-mounted infinity display system development
[AD-A149641] N85-21159
Optical fiber communications link design in compliance with systems performance standards
[PB85-111037] N85-21489
1.5 to 1.7 micrometers LEDs (Light-Emitting Diode)
[AD-A149685] N85-21508
Temperature-insensitive optical fibers
[AD-D011551] N85-22142
Design of an optical proximity sensor using multiple cones of light for measuring surface shape — application to a robot manipulator
[AD-A150050] N85-22152
The future of lightwave technology
[PB85-109759] N85-22155
FIBER REINFORCED COMPOSITES
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Nonlinear analysis for high-temperature multilayered fiber composite structures — turbine blades
[NASA-TM-83754] N85-21273
FIELD EFFECT TRANSISTORS
High-voltage, high-power, solid-state remote power controllers for aerospace applications
[NASA-TP-2437] N85-21263
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability
[AD-A150004] N85-21515
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632
Process for making a heterojunction source-drain insulated gate field-effect transistors utilizing diffusion to form the lattice
[AD-D011536] N85-22176
Electrical performance of semiconductor devices at cryogenic temperatures N85-22239
FIELD OF VIEW
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
Focal plane array optical proximity sensor
[NASA-CASE-NPO-15155-1] N85-22139
FIELD STRENGTH
User's manual for the University of Houston individual heliostat layout and performance code
[DE85-004643] N85-21808
FIELD THEORY (ALGEBRA)
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071
FIELD THEORY (PHYSICS)
Research in theoretical physics
[DE85-004286] N85-22207
FIGHTER AIRCRAFT
Development of the F-20 nose radome
[AD-P004374] N85-21468
Laser clock
[AD-D011513] N85-21634
FILAMENT WINDING
SRM filament wound case resin characterization studies N85-22212
FILM COOLING
Advanced liner-cooling techniques for gas turbine combustors
[NASA-TM-86952] N85-21115
FILTRATION
Carbon filter plates for aluminum filtration at casting
[BMFT-FB-T-84-242] N85-21343
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
FINITE DIFFERENCE THEORY
The split-coefficient matrix method for supersonic three dimensional flow N85-21425
Numerical studies of fluid spin-up from rest in a partially-filled cylinder
[AD-A150079] N85-21586
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
Structural sensitivity analysis: Methods, applications and needs
[NASA-TM-85827] N85-21695
Intensification of tropical instabilities
[AD-A149985] N85-21899
Asymptotics for configural estimators
[AD-A150106] N85-22087
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
FINITE ELEMENT METHOD
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Nonlinear analysis for high-temperature multilayered fiber composite structures — turbine blades
[NASA-TM-83754] N85-21273
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676
3-D inelastic analysis methods for hot section components (base program) — turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
A study of coupling the boundary and finite element methods in two-dimensional elastostatics
[AD-A149619] N85-21702
A solution method for large deformation contact problems
[AD-A149842] N85-21707
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719
Geometrically nonlinear analysis of laminated elastic structures
[NASA-CR-175609] N85-21720
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863
On the accuracy of least squares methods in the presence of corner singularities
[NASA-CR-172552] N85-22050
FIRE FIGHTING
Suppression and control of Class C cargo compartment fires
[FAA/CT-84-21] N85-21133
FIRE PREVENTION
Legislation to improve airline safety
[GPO-38-222] N85-21132
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes
[NASA-CASE-ARC-11512-2] N85-21362
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3874] N85-21675
FIRES
Suppression and control of Class C cargo compartment fires
[FAA/CT-84-21] N85-21133
A study of intumescent reaction mechanisms
[AD-A149605] N85-21365
Collection and use of lightning strike data in the western US during summer 1983
[PB85-110534] N85-21907
Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials
[AD-A149647] N85-21961
FISSION
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
FITTING
Use of ranks to fit a linear model to cross-sectional data with an application to biological rhythms
[MATHEMATICS-RESEARCH-169] N85-22061
FLAME HOLDERS
Flameholder with integrated air mixer
[AD-D011549] N85-21161
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3866] N85-21166

On the coupling of an anchored flame with an acoustic field
[COLL-AERON-8434] N85-21282

FLAME PROPAGATION
Behavior of the lean methane-air flame at zero-gravity
[NASA-CR-175586] N85-21283
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299

FLAME RETARDANTS
A study of intumescent reaction mechanisms
[AD-A149605] N85-21365

FLAME STABILITY
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3866] N85-21166

FLAME TEMPERATURE
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297

FLAMES
Behavior of the lean methane-air flame at zero-gravity
[NASA-CR-175586] N85-21283
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297

FLAMMABILITY
Fire-resistant phosphorus containing compounds, polyimides and copolyimides
[NASA-CASE-ARC-11522-2] N85-21363
Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials
[AD-A149647] N85-21961

FLAPPING
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714

FLAPS (CONTROL SURFACES)
An experimental investigation of flap turbulent heat transfer and pressure characteristics in hypersonic flow
N85-21426

FLASKS
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636

FLAT PLATES
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3884] N85-21272
Interaction of part-through cracks in a flat plate
[NASA-CR-175588] N85-21692
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings
[AD-A149748] N85-21704
Scattered data interpolation using thin plate splines with tension
[AD-A149803] N85-21705
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719

FLEXIBILITY
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408

FLEXIBLE BODIES
A deformation analysis of flat flexible gear and its equation of original curved surfaces
[NASA-TM-77493] N85-21660
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693

FLEXIBLE WINGS
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154

FLIGHT CHARACTERISTICS
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157

FLIGHT CONDITIONS
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982
[NASA-TM-86347] N85-21877

FLIGHT CONTROL
Translating rudder pedal system
[AD-D011510] N85-21172
Analytical and flight investigation of the influence of rotor and other high-order dynamics on helicopter flight-control system bandwidth
[NASA-TM-86696] N85-21174
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176
Integrated control system engineering support
[AD-A149742] N85-21177

FLIGHT INSTRUMENTS
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104

FLIGHT MECHANICS
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176

FLIGHT OPERATIONS
New runway enables IL-76 flights to Tenkeli in far north N85-21108

FLIGHT PATHS
Hot radome boresight error measurements
[AD-P004364] N85-21458

FLIGHT SAFETY
Legislation to improve airline safety
[GPO-38-222] N85-21132
Aerospace Safety Advisory Panel
[NASA-TM-87428] N85-21135

FLIGHT SIMULATORS
Transportation
[JPRS-UTR-85-004] N85-21105
New flight simulators at Vnukovo permit less in-flight training N85-21107

FLIGHT TESTS
Collision avoidance for Naval training aircraft
[FAA/PM-84-4] N85-21136
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-208] N85-21157

FLIGHT TIME
General aviation activity and avionics survey
[AD-A149572] N85-21103

FLIGHT TRAINING
New flight simulators at Vnukovo permit less in-flight training N85-21107

FLIP-FLOPS
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149687] N85-21614

FLOTATION
Investigation of foam flotation and phase partitioning techniques N85-22216

FLOW CHARACTERISTICS
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9667-MS] N85-21576

FLOW COEFFICIENTS
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines
[NASA-TM-86926] N85-21569

FLOW DISTRIBUTION
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
Investigation of flowfields found in typical combustor geometries
[NASA-CR-3869] N85-21167

FLOW GEOMETRY
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9667-MS] N85-21576

FLOW VELOCITY
Preliminary analysis of tone-excited two-stream jet velocity decay
[NASA-TM-86951] N85-21114

FLOW VISUALIZATION
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150060] N85-21587

FLOWMETERS
State-of-charge coulometer
[NASA-CASE-NPO-15759-1] N85-21596

FLUID DYNAMICS
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion
[NASA-TM-86969] N85-21231
Numerical studies of fluid spin-up from rest in a partially-filled cylinder
[AD-A150079] N85-21586
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
A study of the compatibility of an existing CFD package with a broader class of material constitutions
N85-22219
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243

FLUID FILTERS
Carbon filter plates for aluminum filtration at casting
[BMFT-FB-T-84-242] N85-21343

FLUID FLOW
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
A two-axis, self-nulling skin friction balance
[NASA-CASE-LAR-13294-1] N85-21610
Computer-Aided Structural Engineering (CASE) project. Seepage analysis of confined flow problems by the method of fragments (CFRAG)
[AD-A150015] N85-21762

FLUID JETS
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590

FLUID MECHANICS
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion
[NASA-TM-86969] N85-21231
Nested subcritical flows within supercritical systems
[NASA-TM-86980] N85-21574
Arc-driven rail gun research
[NASA-CR-174816] N85-21662
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271

FLUID PRESSURE
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain
[DE85-003294] N85-21664

FLUIDS
Self-charging metering and dispensing device for fluids
[NASA-CASE-MSC-20275-1] N85-21595

FLUORESCENCE
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292

FLUORIDES
Optically pumped iodine monofluoride laser
[AD-D011555] N85-21637

FLUORITE
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2
[AD-A150131] N85-22187

FLUOROPOLYMERS
Fluorinated polyurethanes
[AD-D011526] N85-21353

FLUTTER ANALYSIS
Exploratory flutter test in a cryogenic wind tunnel
[NASA-TM-86380] N85-21669

FLUX DENSITY
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250
Magnetic field in main gap of separator N85-21563

FLY BY WIRE CONTROL
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175

FLYING PERSONNEL
Review of US manual of clinical aviation medicine
N85-21957
Review of US guide on medication and flying
N85-21958

FOAMS
X-ray gauge measures areal density variations as small as 0.1%
[DE85-003774] N85-21629
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828

Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials
[AD-A149647] N85-21961
FOKKER-PLANCK EQUATION
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005136] N85-22124
FOLDING STRUCTURES
Deployable folded antenna apparatus
[AD-D011503] N85-21495
Variable geometry truss concept
[REPT-614] N85-21697
FORCED VIBRATION
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
FOREST MANAGEMENT
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
FORESTS
Effects of air pollution and acid rain on forest decline
[GPO-37-459] N85-21818
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825
FORM FACTORS
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194
FORMAT
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867
The four forms of omega
[AD-A149694] N85-22020
FORMATION
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297
FORTRAN
DOS 21: PCDOS 2.0 support subroutine package for the IBM personal computer
[LA-10142-MS] N85-22012
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013
ZTLCK: A subroutine package for the IBM personal computer to support the Zlatech ZT1488 real time clock
[LA-10146-MS] N85-22014
Ryan-McFarland Corporation, IBM PC model XT, RM/FORTRAN, version 2.0.0
[PB85-107993] N85-22037
Ryan-McFarland Corporation, sun microsystem with sky fast floating point processor, RM/FORTRAN version 1.5.0
[PB85-108009] N85-22038
Selection and use of general-purpose programming-language: Program examples, volume 2
[PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1
[PB85-122018] N85-22040
FORWARD SCATTERING
Surface forward scattering and reflection
[AD-A150115] N85-22112
FOULING
Investigation of the initial events in biofouling
[AD-A149995] N85-21927
FOUNDATIONS
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
FOUNDRIES
Theoretical and experimental investigations of dust loaded flow fields in industrial halls
[BMFT-FB-HA-84-044] N85-21411
FOURIER ANALYSIS
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
Mathematical simulation of thermal processes involved in electron-beam treatment N85-21565
A two-dimensional smoothing spline and a regression problem
[AD-A149624] N85-22067
FOURIER TRANSFORMATION
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967
FRACTURE MECHANICS
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity
[NASA-CR-174872] N85-21685
Fracture analysis of cracks in complete cylindrical shells
[AD-A150091] N85-21711
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain
[DE85-003294] N85-21864
Reliability of structural brittle materials N85-22222
FRACTURE STRENGTH
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
Effects of neutron irradiation on the fracture properties of HT-9 weld
[DE85-001068] N85-21339
Fracture toughness of materials
[DE85-004306] N85-21713
FRACTURING
Reliability of structural brittle materials N85-22222
Physiography of the Martian west equatorial uplift N85-22325
FRAGMENTATION
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
FRAMES
Alternative approximation concepts for space frame synthesis
[NASA-CR-172526] N85-21150
FRANCE
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
FREE ELECTRON LASERS
Betatron-synchrotron detrapping in a tapered wiggler free electron laser
[AD-A149686] N85-21642
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study
[AD-A150059] N85-21645
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths
[DE85-000662] N85-21646
FREE ELECTRONS
RF-Primed high power halogen vial apparatus
[AD-D011545] N85-22156
FREE ENERGY
Simple EOS for the silicone rubber Sylgard 184
[DE85-001394] N85-21376
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072
Green's function solution of the Kondo problems and universality of the thermodynamic properties
[DE85-002739] N85-22206
FREQUENCY ASSIGNMENT
Engineering calculations for communications satellite systems planning
[NASA-CR-175552] N85-21233
FREQUENCY CONVERTERS
Wideband phase keyers N85-21544
FREQUENCY HOPPING
Spread spectrum mobile radio communications
[AD-A149936] N85-21477
FREQUENCY RANGES
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238
FREQUENCY STABILITY
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
FREQUENCY SYNCHRONIZATION
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504
FRETTING
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V — titanium alloy
[DGT-25369-PT-1] N85-21341
FRICTION
Techniques to analyze vehicle coastdown data
[DE85-005159] N85-21127
Tribological properties of boron nitride synthesized by ion beam deposition
[NASA-TM-86962] N85-21355
Tribological systems as applied to aircraft engines
[NASA-TM-86985] N85-21657
Skid steering of wheeled and tracked vehicles: Analysis with Coulomb friction assumptions
[AD-A149826] N85-21684
FRICTION MEASUREMENT
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125
A two-axis, self-nulling skin friction balance
[NASA-CASE-LAR-13294-1] N85-21610
FUEL CAPSULES
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
FUEL COMBUSTION
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3666] N85-21166
FUEL PRODUCTION
Developments in the production and use of ethanol fuels
[GPO-40-678] N85-21396
FUEL SPRAYS
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
FUEL TANKS
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products
[AD-A149777] N85-21368
FUEL-AIR RATIO
Combustion gas properties. 2: Natural gas fuel and dry air
[NASA-TP-2435] N85-21168
Behavior of the lean methane-air flame at zero-gravity
[NASA-CR-175586] N85-21283
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149825] N85-21581
FUNCTION SPACE
Asymptotic behavior of matrix coefficients related to reductive symmetric spaces
[CWI-PM-R8410] N85-22095
FUNCTIONS (MATHEMATICS)
Axiomatic characterizations of continuum structure functions
[AD-A149617] N85-21706
Software for special functions
[DE85-004684] N85-22033
A proposal for standard basic functions in Ada
[CWI-NM-R8407] N85-22036
FUSION WELDING
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology
[BMFT-FB-T-84-236] N85-21672

G

GALACTIC CLUSTERS
Plasma in the clusters of galaxies N85-22299
GALACTIC EVOLUTION
Cosmology, galactic astronomy and elementary particle physics N85-22289
Jets in galaxies N85-22309
Galaxy formation N85-22321
GALACTIC NUCLEI
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
Viscous jets — extragalactic jets N85-22308
Small scale structure and the Spinar model for active galactic nuclei N85-22316
GALACTIC RADIATION
IRAS observations of Seyfert galaxies
[NASA-CR-175557] N85-22267
GALACTIC ROTATION
On a spectral theory of the excitation mechanism of galactic spirals N85-22284
GALACTIC STRUCTURE
On the morphology of spiral modes — disk galaxies N85-22283
Drift-accretion theory of the spiral structure of galaxies N85-22296
Some constraints on magnetic fields in galactic spiral arms N85-22300

Small scale structure and the Spinar model for active galactic nuclei N85-22316
GALERKIN METHOD
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072
GALILEO SPACECRAFT
Solid particle environment and protection for the Galileo Orbiter N85-21207
GALLIUM
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183
GALLIUM ARSENIDES
GaAs and 3-5 compound solar cells status and prospects for use in space
[NASA-TM-86960] N85-21261
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates
[FOA-C-30383-E] N85-21527
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181
Semiconductor materials for high frequency solid state sources
[AD-A150020] N85-22186
Evaluation of implantation-disordering of (InGa)As/GaAs strained-layer superlattices
[DE85-003533] N85-22200
GAME THEORY
A computer-based gaming system for assessing recognition performance (RECOG)
[AD-A149752] N85-22022
GAMMA RAY SPECTROMETERS
Description of the SSB/A (Special Sensor B/Aerospace X-ray spectrometer
[AD-A150040] N85-21236
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
GAMMA RAYS
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples
[AERE-R-10549] N85-22173
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278
Research in particles and fields
[NASA-CR-175472] N85-22337
GAPS
Magnetic field in main gap of separator N85-21563
GAS CHROMATOGRAPHY
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
Isolation, concentration and subsequent analysis by capillary gas chromatography of trace amounts of organophosphorus compounds from aqueous samples
[AD-B089301L] N85-21308
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 2: Program documentation, version 1.0
[PB85-116069] N85-21310
GAS COOLING
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
GAS DETECTORS
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
Portable remote laser sensor for methane leak detection
[NASA-CASE-NPO-15790-1] N85-21631
GAS DISCHARGES
RF-Primed high power halogen vial apparatus
[AD-D011545] N85-22156
GAS DYNAMICS
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion
[NASA-TM-86969] N85-21231
Front tracking and two dimensional Riemann problems: A conference report
[DE85-002209] N85-21589
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals
[NASA-TM-83800] N85-22204
Viscous jets — extragalactic jets N85-22308
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-cometary and planetary studies
[NASA-CR-175490] N85-22331
GAS EXCHANGE
External respiration, gas exchange and energy expenditures of man in weightlessness N85-21932
GAS FLOW
Front tracking and two dimensional Riemann problems: A conference report
[DE85-002209] N85-21589
An investigation of aerowindows for solar receivers
[DE84-010931] N85-21772
GAS INJECTION
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644
GAS JETS
Development of the sonic pump levitator
[NASA-CR-171382] N85-21186
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
GAS LASERS
Axial flow laser cavity
[AD-D011506] N85-21633
Optically pumped iodine monofluoride laser
[AD-D011555] N85-21637
GAS MIXTURES
Basic studies of gases for fast switches
[AD-A149828] N85-21514
GAS TUNGSTEN ARC WELDING
Characterization of the heat source distribution of a typical GTAW welding arc
[DE85-004322] N85-21670
Sensor control of robot arc welding N85-22233
GAS TURBINE ENGINES
Advanced liner-cooling techniques for gas turbine combustors
[NASA-TM-86952] N85-21115
Combustion research for gas turbine engines
[NASA-TM-86963] N85-21164
Evaluation results of the 700 deg C Chinese strain gauges — for gas turbine engine
[NASA-TM-86973] N85-21605
Advanced thin film thermocouples
[NASA-CR-175541] N85-21607
GAS TURBINES
Evaluation of corrosion-erosion behavior of various ceramic materials
[AD-A149756] N85-21367
Cost comparison of small gas turbines versus electric motors in a variable load industrial application
[PB85-149763] N85-21530
High pressure turbine rotor two-piece blade retainer
[AD-D011498] N85-21653
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671
GAS VISCOSITY
Viscous jets — extragalactic jets N85-22308
GAS-METAL INTERACTIONS
Electrochemical cell to measure corrosion rates in noncondensing environments
[DE85-003148] N85-21338
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358
GASES
Photoacoustic effect and its applications N85-21421
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21632
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
GASOHOL (FUEL)
Developments in the production and use of ethanol fuels
[GPO-40-679] N85-21398
GATES (CIRCUITS)
Automatic pickup of trajectory by method of sequential analysis taking into account deviation of radar markers from center of strobe N85-21535
GAUSS EQUATION
Mathematical simulation of thermal processes involved in electron-beam treatment N85-21565
GEARS
A deformation analysis of flat flexible gear and its equation of original curved surfaces
[NASA-TM-77493] N85-21660
GENERATORS
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
GENETICS
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
GEOCHEMISTRY
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138
GEODESIC LINES
Harmonic analysis and Radon transforms on pencils of geodesics
[CWI-PM-R8413] N85-22074
GEODESY
Program INNAVSAT: Global Positioning System (GPS): Test and demonstration program
[BMFT-FB-W-84-047] N85-21145
Hybrid method of mapping and photogeodetic control network densification
[PB85-133775] N85-21766
GEODETIC SURVEYS
Hybrid method of mapping and photogeodetic control network densification
[PB85-133775] N85-21766
Planetary cartography in the next decade (1984 - 1994)
[NASA-SP-475] N85-22323
GEOGRAPHIC INFORMATION SYSTEMS
Building a functional, integrated GIS/remote sensing resource analysis and planning system — Utah
[E85-10092] N85-21754
GEOGRAPHY
Review of computer mapping and display techniques applicable to regional analysis
[DE85-003545] N85-21764
GEOIDS
Physiography of the Martian west equatorial uplift N85-22325
GEOLOGICAL SURVEYS
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications — Drum Mountains, Utah and Tonopath, Nevada
[E85-10095] N85-21757
GEOMAGNETIC LATITUDE
An atlas of polar cap energetic particle observations. Volume 2: NOAA-6, 8 July 1979 to 10 May 1983
[PB85-109072] N85-21868
GEOMAGNETISM
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859
Circulation and internal waves in a cold Gulf Stream wave
[AD-A149704] N85-21918
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
Models of the upper atmosphere N85-22217
Particle transport in planetary magnetospheres N85-22275
GEOMETRIC ACCURACY
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
A preliminary assessment of LANDSAT-4 Thematic Mapper data — Windsor, Ontario and Medicine Hat areas, Canada N85-21728
TM geometric performance: Line to Line Displacement Analysis (LLDA) — New Mexico N85-21732
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
GEOMETRICAL OPTICS
An iteration method for complex scattering problems
[AD-A150038] N85-22151
GEOMORPHOLOGY
Physiography of the Martian west equatorial uplift N85-22325
GEOPHYSICS
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data
[NASA-CR-175542] N85-22333
GEOSYNCHRONOUS ORBITS
Assessment of satellite collision hazards by simulated sampling in space N85-21195
Geosynchronous satellite collision avoidance N85-21197
The long term behaviour of Earth orbits and the implications for debris control N85-21213

Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories [NASA-TM-86946] N85-21228
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment [AD-A149728] N85-21252

GEOTHERMAL ENERGY UTILIZATION
Two-phase flow in geothermal systems [DE85-004692] N85-21591
Leak detectors for organic Rankine cycle power plants: On-line and manual methods [DE85-002792] N85-21617

GEOTHERMAL RESOURCES
Heat Cycle Research Experimental Program report, FY-84 [DE85-003558] N85-21811
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain [DE85-003294] N85-21864

GEOTHERMAL TECHNOLOGY
Two-phase flow in geothermal systems [DE85-004692] N85-21591
Thermophysical properties of working fluids for binary geothermal cycles [DE85-000365] N85-21604

GERMANIUM
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228

GETTERS
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes [DE85-000661] N85-21521
Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785

GLASS
Magnetically-induced luminescence of (tr(2=phox)(2)C10(4) [AD-A149659] N85-21286
Ring-on-ring tests and load capacity of cladding glass [PB85-106391] N85-21717

GLASS FIBER REINFORCED PLASTICS
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data [AD-A149810] N85-21275
Scale-up of vanadium trineodecanoate [AD-A149935] N85-21370

GLASS FIBERS
Stress-relieving interlayers for bituminous resurfacings [PB85-136885] N85-21415

GLAZES
Improvements in glazings: SERI materials research in progress [DE84-013049] N85-21378

GLOBAL POSITIONING SYSTEM
Program INNAVSAT: Global Positioning System (GPS): Test and demonstration program [BMFT-FB-W-84-047] N85-21145
Hybrid method of mapping and photogeodetic control network densification [PB85-133775] N85-21766

GLOW DISCHARGES
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558

GLUCOSE
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rheseus monkeys N85-21946

GOALS
High-technology ceramics in Japan [PB85-125029] N85-21389

GOBI DESERT
Measurements of the surface energy budget in the southern Gobi Desert of China, and in the Rocky Mountains of Colorado [NASA-CR-175506] N85-21847

GOLD
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds [AD-A150000] N85-22183
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2 [AD-A150131] N85-22187
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions [DE85-000887] N85-22192
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries [DE85-004598] N85-22201

GOLD ALLOYS
Sputter-induced compositional modifications in a Ni-Au alloy [DE85-002771] N85-21333

GOODNESS OF FIT
Tests of fit based on normalized spacings [AD-A149749] N85-22062

GOVERNMENT/INDUSTRY RELATIONS
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy [GPO-41-060] N85-22244
Transfer of technology [S-REPT-98-654] N85-22246

GOVERNMENTS
Oversight review of the five-year outlook report on science and technology [GPO-41-058] N85-22243
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy [GPO-41-060] N85-22244

GRADIENTS
Rotating squid magnetometers and gradiometers [AD-D011529] N85-21600
Determining object orientation from a single image using multiple information sources [AD-A149860] N85-22146

GRAIN BOUNDARIES
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra [DE85-003259] N85-22114
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries [DE85-004598] N85-22201

GRAMMARS
An algorithm for generating abstract syntax trees [NASA-CR-172541] N85-22003

GRANULAR MATERIALS
Carbon granule probe microphone for leak detection — recovery boilers [NASA-CASE-NPO-16027-1] N85-21597
Large-size fine-granular graphite for solar techniques N85-21780

GRAPHITE
Investigation of electric and magnetic properties of intercalated graphite [AD-A149801] N85-21274
Electric and magnetic properties of intercalated graphite [AD-A149848] N85-21276
Fine-grained, isotropic graphite for use as NBS (National Bureau of Standards) thermophysical property RM's from 5 to 2500 K [PB85-112686] N85-21381
Large-size fine-granular graphite for solar techniques N85-21780
Sound velocity of carbon at high pressures [DE85-002016] N85-22113
Neutron scattering studies of graphite intercalation compounds [DE85-003079] N85-22196
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214

GRAPHITE-EPOXY COMPOSITES
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends [NASA-TM-86355] N85-21270
Accelerated viscoelastic characterization of T300-5208 graphite-epoxy laminates [NASA-CR-3871] N85-21271
Rubber modified epoxy adhesive [AD-D011527] N85-21354
SRM filament wound case resin characterization studies N85-22212

GRAPHITIZATION
Rubber modified epoxy adhesive [AD-D011527] N85-21354

GRAPHS (CHARTS)
Maximum matchings in a class of random graphs [AD-A149663] N85-22060

GRATINGS (SPECTRA)
STS atmospheric luminosities [NASA-CR-175514] N85-21240
Solar energy converter using surface plasma waves [NASA-CASE-LEW-13827-1] N85-21768
High resolution diffraction grating [AD-D011541] N85-22141
Properties of chirped grating lenses in optical waveguides [AD-A150023] N85-22149
Switchable zero order diffraction gratings as light valves [AD-A150129] N85-22153
Study of the potential usefulness of superfine holographic x-ray gratings in AXAF and astrophysics in general N85-22215

GRAVIMETRY
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942

GRAVITATIONAL PHYSIOLOGY
Modular plant culture systems for life support functions [NASA-CR-171853] N85-21924

GRAVITY WAVES
Mesh effects on the computation of non-linear gravity waves of arbitrary discharge [COLL-AERON-8501] N85-21848
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn [NASA-CR-175554] N85-22327

GREEN'S FUNCTIONS
Noise transmission loss of a rectangular plate in an infinite baffle [NASA-TP-2398] N85-22109
Green's function solution of the Kondo problems and universality of the thermodynamic properties [DE85-002739] N85-22206

GRIDS
Semianalytic modeling of aerodynamic shapes [NASA-TP-2413] N85-21120
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration [AD-A149869] N85-21665

GRINDING (MATERIAL REMOVAL)
Parametric evaluation of ball milling of SiC in water [NASA-TM-86974] N85-21356

GRINDING MILLS
Improved silicon grinding method and apparatus [NASA-CASE-NPO-16336-1-CU] N85-21407

GROUND EFFECT MACHINES
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials [AD-A149701] N85-21408

GROUND STATE
Control of electronic, magnetic and optical properties of doped polyacetylene conductors [AD-A150117] N85-21375

GROUND SUPPORT SYSTEMS
A mathematical formulation of the problem of optimal use of ground resources for future space missions N85-22232

GROUND TESTS
NASA/MSFC ground experiment for large space structure control verification [NASA-TM-86496] N85-21248
Definition of ground test for Large Space Structure (LSS) control verification [NASA-TM-86495] N85-21249

GROUND WATER
ELECT groundwater transport research code [DE85-003284] N85-21824
Shallow land burial technology: Humid [DE85-004432] N85-22136
Research and development related to the Nevada nuclear waste storage investigations [DE85-002303] N85-22138

GROUND WAVE PROPAGATION
Measurements and predictions of HF ground wave radio propagation over irregular, inhomogeneous terrain [PB85-110666] N85-21487

GROUND WIND
Wind shear detection technology [GPO-38-920] N85-21879

GROUP DYNAMICS
Team dimensions: Their identity, their measurement and their relationships [AD-A149662] N85-21978

GROUP THEORY
Multi-sample cluster analysis as an alternative to multiple comparison procedures [AD-A149960] N85-22064
On ergodic actions whose self-joinings are graphs [CWI-PM-R8408] N85-22093

GROWTH
User's guide to the TAMW wheat model as implemented on the IBM 360/195 computer [E85-10084] N85-21749
Purification and cultivation of human pituitary growth hormone secreting cells [NASA-CR-171848] N85-21923

GUAYULE
Process development for commercial production of natural rubber from Guayule [PB85-124956] N85-21388

GUIDANCE (MOTION)
Optimization of guidance and control using function minimization and NAVSTAR/GPS
[AD-A149956] N85-21141
GULF STREAM
Circulation and internal waves in a cold Gulf Stream wave
[AD-A149704] N85-21918
Biological processes in the water column of the South Atlantic Bight. Volume 1: Published manuscripts
[DE85-004610] N85-21929
GUNN EFFECT
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates
[FOA-C-30383-E] N85-21527
GUNS (ORDNANCE)
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
GUST LOADS
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881
GUSTS
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113
GYRO HORIZONS
Attitude data consistence check of rocket payloads
[BMFT-FB-W-84-049] N85-21239

H

HADRONS
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119
HALF PLANES
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-409] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-408] N85-21701
HALL EFFECT
Power circuit utilizing self-excited Hall effect switch means
[AD-D011505] N85-21496
HALLEY'S COMET
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives
[NASA-TM-77536] N85-22324
HALOGENS
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301
RF-Primed high power halogen vial apparatus
[AD-D011545] N85-22156
HAMILTONIAN FUNCTIONS
A method of calculating periodic solutions of second order dynamical systems
[AD-A149634] N85-22058
HAND (ANATOMY)
Mechanical properties for the grasp of a robotic hand
[AD-A150062] N85-21669
HANDBOOKS
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-106512] N85-21867
Review of US guide on medication and flying N85-21958
HARDWARE
ZTLCK: A subroutine package for the IBM personal computer to support the Zistech ZT1488 real time clock
[LA-10146-MS] N85-22014
HARMONIC ANALYSIS
A deformation analysis of flat flexible gear and its equation of original curved surfaces
[NASA-TM-77493] N85-21660
Harmonic analysis and Radon transforms on pencils of geodesics
[CWI-PM-R8413] N85-22074
HARMONIC GENERATIONS
Digital detector of harmonic signals N85-21549
HARMONICS
Some individual differences in human response to infrasound
[UTIAS-282] N85-21960
HAULING
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
HAZARDOUS MATERIAL DISPOSAL (IN SPACE)
A model for the evolution of on-orbit manmade debris environment N85-21196
HAZARDS
A model for the evolution of on-orbit manmade debris environment N85-21196
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
Orbital debris policy issues: Battelle involvement and some personal observations N85-21218
Spacecraft hazard and shielding requirements N85-21224
Hazardous air pollutants: Dry-deposition phenomena
[PB85-138279] N85-21843
HEAD-UP DISPLAYS
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
HEART FUNCTION
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
HEAT ACCLIMATIZATION
Preventive effect of acute heat factors during hypokinesia N85-21945
HEAT EXCHANGERS
Steam generator tube vibration tests
[DE85-003599] N85-21712
Direct-contact condensers for solar pond power production
[DE84-004510] N85-21771
HEAT FLUX
Heat flux in Lorentzian plasma
[IPPJ-704] N85-22158
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report
[DE85-003715] N85-22169
HEAT MEASUREMENT
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
HEAT PIPES
Space heat rejection radiators: Meteoroid/debris consideration N85-21210
Heat pipe cooled probe
[NASA-CASE-LAR-12588-1] N85-21568
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
HEAT PUMPS
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010813] N85-21798
HEAT RESISTANT ALLOYS
Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties
[NASA-CR-174841] N85-21320
Investigation of the development possibilities of a ferritic creep and oxidation-resistant steel for application under creep conditions above 650 deg C
[BMFT-FB-T-84-244] N85-21344
HEAT SOURCES
General-purpose heat source developmet: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
General-purpose heat source development: Szfety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9680-SR] N85-22131
HEAT STORAGE
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806
Phase change thermal energy storage and the model building codes
[PB85-111201] N85-21813
HEAT TOLERANCE
Preventive effect of acute heat factors during hypokinesia N85-21945
HEAT TRANSFER
Advanced liner-cooling techniques for gas turbine combustors
[NASA-TM-86952] N85-21115
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Improvements in glazings: SERI materials research in progress
[DE84-013049] N85-21378
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
Nested subcritical flows within supercritical systems
[NASA-TM-86980] N85-21574
Mechaniams of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
Experimental study of steam condensation on water in countercurrent flow in presence of inert gases
[DE84-013028] N85-21800
Multi-year plan for Experimental Systems Research: Passive and hybrid solar energy program
[DE85-004698] N85-21810
Heat Cycle Research Experimental Program report, FY-84
[DE85-003558] N85-21811
Multiyear plan for experimental systems research passive and hybrid solar energy program
[PB85-146868] N85-21815
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9680-SR] N85-22131
HEAT TRANSFER COEFFICIENTS
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583
HEAT TRANSMISSION
Characterization of the heat source distribution of a typical GTAW welding arc
[DE85-004322] N85-21670
HEAT TREATMENT
Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
Microstructural and electronic characteristics of metallic spin glasses
[AD-A149959] N85-21371
HEATING
Improvements in glazings: SERI materials research in progress
[DE84-013049] N85-21378
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
HEAVY IONS
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions
[DE85-000887] N85-22192
HELICOPTER TAIL ROTORS
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112
HELICOPTERS
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
Analytical and flight investigation of the influence of rotor and other high-order dynamics on helicopter flight-control system bandwidth
[NASA-TM-86696] N85-21174
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881
HELIOSPHERE
A new radio emission at 3 kHz in the outer heliosphere N85-22312
HELIOSTATS
User's manual for the University of Houston individual heliostat layout and performance code
[DE85-004643] N85-21808
Ecological observations at the site of the 10 MWe solar thermal power system (1979-1984)
[DE85-004572] N85-21827
HELIPORTS
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881
HELIUM
A Jamin interferometer to determine the helium abundance in the atmosphere of Jupiter
[BONN-IR-83-17] N85-22329
HELMET MOUNTED DISPLAYS
Wide-field-of-view, helmet-mounted infinity display system development
[AD-A149841] N85-21159
HEMATOLOGY
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947

Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966

HERBICIDES
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928

HERBIG-HARO OBJECTS
Plasma processes in Herbig-Haro objects N85-22301

HETEROGENEITY
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149625] N85-21581

HETEROJUNCTION DEVICES
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals
[AD-A149760] N85-21290

HETEROJUNCTIONS
Multiple double heterojunction buried laser device
[AD-D011519] N85-21635
Process for making a heterojunction source-drain insulated gate field-effect transistors utilizing diffusion to form the lattice
[AD-D011536] N85-22176

HEURISTIC METHODS
Learning to search. From weak methods to domain-specific heuristics
[AD-A149949] N85-22045
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
State dependent priority rules for scheduling
[AD-A149972] N85-22090

HIGH ALTITUDE BALLOONS
Thin film strain transducer --- suitable for in-flight measurement of scientific balloon strain
[NASA-CASE-WLP-10055-2] N85-21598

HIGH ENERGY INTERACTIONS
Research and technology: Fiscal year 1984 report
[NASA-TM-85231] N85-22340

HIGH FREQUENCIES
An electronically-steerable active receiving array for h.f.
[BBC-RD-1985/2] N85-21430
Surface forward scattering and reflection
[AD-A150115] N85-22112
Stress compensation crystal device
[AD-D011497] N85-22189

HIGH LEVEL LANGUAGES
A Gypsy-to-Ada program compiler
[TR-39] N85-22005
Very-high level concurrent programming
[AD-A150009] N85-22026

HIGH PRESSURE
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644
High pressure turbine rotor two-piece blade retainer
[AD-D011498] N85-21653
Sound velocity of carbon at high pressures
[DE85-002016] N85-22113

HIGH RESOLUTION
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860

HIGH SPEED
Diesel fuel alternatives for engines in civil works prime movers
[AD-A149738] N85-21400
Lubrication and performance of high-speed rolling-element bearings
[NASA-TM-86958] N85-21658

HIGH STRENGTH STEELS
High strength steel sheet with dual phase structure
[BMFT-FB-T-84-219] N85-21342

HIGH TEMPERATURE
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
Chemical approach for controlling nadimide cure temperature and rate
[NASA-CASE-LEW-13770-5] N85-21352
High-temperature-stable detonators
[DE85-005188] N85-21402

A millimeter wave apparatus for free-space measurement of dielectric constants at high temperature
[AD-P004361] N85-21455
3-D inelastic analysis methods for hot section components (base program) --- turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
Fast times at high temperatures
[DE85-003306] N85-22205

HIGH TEMPERATURE ENVIRONMENTS
Heat pipe cooled probe
[NASA-CASE-LAR-12588-1] N85-21568
Evaluation results of the 700 deg C Chinese strain gauges --- for gas turbine engine
[NASA-TM-86973] N85-21605

HIGH TEMPERATURE PLASMAS
On the spectrum of longitudinal waves in the hot degenerate plasma N85-22280
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297

HIGH TEMPERATURE TESTS
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260
Development of a high temperature single impact rain erosion test capability
[AD-P004371] N85-21465
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines
[NASA-TM-86928] N85-21569
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624

HIGH VACUUM
Vacuum chamber pressure effects on thrust measurements of low Reynolds number nozzles
[NASA-TM-86955] N85-21259

HIGH VOLTAGES
Study of electric field and ion effects on HVDC lines
[DE85-002975] N85-21503

HISTOGRAMS
Determining object orientation from a single image using multiple information sources
[AD-A149980] N85-22146

HISTOLOGY
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942

HISTORIES
A history of full-scale testing of aircraft structures at the National Aeronautical Establishment
[NAE-AN-24] N85-21153
Discovery of the solar wind N85-22272
Chronology of KSC and KSC related events for 1983
[NASA-TM-87435] N85-22339

HOLE GEOMETRY (MECHANICS)
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676

HOLES
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-409] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-406] N85-21701

HOLLOW CATHODES
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103

HOLMIUM
Magnetic X-ray scattering studies of the rare Earth metal holmium
[DE85-003608] N85-21335

HOLOGRAPHIC INTERFEROMETRY
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112

HOLOGRAPHY
Study of the potential usefulness of superfine holographic x-ray gratings in AXAF and astrophysics in general N85-22215

HOMEOSTASIS
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943

HONEYCOMB CORES
Integrated insulation wall assembly --- for a solid rocket motor case
[AD-D011553] N85-21257

HORIZONTAL ORIENTATION
Intensification of tropical instabilities
[AD-A149985] N85-21899

HORMONES
Purification and cultivation of human pituitary growth hormone secreting cells
[NASA-CR-171846] N85-21923

HOT CORROSION
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358

HOT PRESSING
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358
Pressureless sintered silicon nitride as a promising candidate for radome materials
[AD-P004367] N85-21461

HOT WORKING
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V --- titanium alloy
[DGT-25369-PT-1] N85-21341

HOVERING
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112

HUMAN BEINGS
The effect of jamming/deception on decision making
[AD-A149740] N85-21472

HUMAN BODY
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962

HUMAN FACTORS ENGINEERING
Proceedings of the 6th Advanced Aircrew Display Symposium
[AD-A150044] N85-21160
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980
Proceedings of the 6th Human Factors Workshop on Aviation
[AD-A150043] N85-21962
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11543-1] N85-21966
Torso sizing ring construction for hard space suit
[NASA-CASE-ARC-11616-1] N85-21967
Very-high level concurrent programming
[AD-A150009] N85-22026

HUMAN PERFORMANCE
Team dimensions: Their identity, their measurement and their relationships
[AD-A149662] N85-21978
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985
The man-machine interface
[AD-A149971] N85-21989
Task influences in the analytic-intuitive approach to decision making
[AD-A149870] N85-22250

HUMAN REACTIONS
Role of mental work in human tolerance in total-body vibration N85-21940
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
Some individual differences in human response to infrasound
[UTIAS-262] N85-21960

HUMAN TOLERANCES
Some individual differences in human response to infrasound
[UTIAS-262] N85-21960

HUMIDITY
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359

HURRICANES
Hurricane storm surge research
[GPO-40-048] N85-21880
Hurricane alicia storm surge and wave data
[AD-A149668] N85-21896

HYDRAULIC EQUIPMENT
Integrated paratroop door
[AD-D011507] N85-21148
HYDRAZINES
The use of hydrazine as an alternate source of energy
[NASA-CR-175535] N85-21397
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399
HYDROCARBON FUELS
Combustion gas properties. 2: Natural gas fuel and dry air
[NASA-TP-2435] N85-21168
HYDROCARBONS
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles
[DE85-004319] N85-21306
Oxidation and gum formation in jet fuels
[AD-A149934] N85-21401
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149698] N85-21988
HYDRODYNAMIC EQUATIONS
Nonlinear waves in the magnetosphere of pulsars
N85-22281
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313
HYDRODYNAMICS
Investigation of the initial events in biofouling
[AD-A149995] N85-21927
Processes and problems in secondary star formation
[DE85-003623] N85-22322
HYDROFOIL CRAFT
A broadband kevlar radome for shipboard
[AD-P004365] N85-21459
HYDROGEN
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base
[RAD-84-203-001-80-21] N85-21230
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
HYDROGEN CHLORIDES
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177
HYDROGEN EMBRITTLEMENT
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers
[ARL-MAT-R-117] N85-21326
HYDROGEN OXYGEN ENGINES
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion
[NASA-TM-86969] N85-21231
HYDROGEN PRODUCTION
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
Solar-assisted hydrogen generation by photoelectrocatalysis
[PB85-149706] N85-21314
HYDROGENATION
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes
[NASA-CASE-ARC-11512-2] N85-21362
HYDROGENOLYSIS
Properties of supported metal catalysts
[DE85-003927] N85-21303
HYDROLOGY
Review of computer mapping and display techniques applicable to regional analysis
[DE85-003545] N85-21764
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117984] N85-21869
HYDROLYSIS
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21826
HYDROPLANING
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179
HYDROSTATIC PRESSURE
Human lung fluid content during 7-day head-down tilt
N85-21941
High pressure environmental conditioning systems and chamber rehabilitation
[AD-A150039] N85-21964
HYDROXIDES
Evaluation of ettringite and related compounds for use in solar energy storage
[DE85-003249] N85-21809
HYDROXYCORTICOSTEROID
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935
HYPERBOLIC DIFFERENTIAL EQUATIONS
A convergent series expansion for hyperbolic systems of conservation laws
[NASA-CR-172557] N85-21990
HYPERGOLIC ROCKET PROPELLANTS
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399
HYPERSONIC BOUNDARY LAYER
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150080] N85-21587
HYPERSONIC HEAT TRANSFER
An experimental investigation of flap turbulent heat transfer and pressure characteristics in hypersonic flow
N85-21426
HYPERSONIC SPEED
Fiber reinforced fused silica for hypersonic radome applications
[AD-P004366] N85-21460
HYPERVELOCITY GUNS
Electromagnetic rail launcher as a circuit element
[AD-A150067] N85-21516
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
HYPERVELOCITY IMPACT
Orbital Debris
[NASA-CP-2360] N85-21188
Manmade orbital debris studies at NASA Langley
N85-21192
Hypervelocity impacts on Skylab 4/Apollo windows
N85-21202
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab
N85-21206
Debris impact on Earth-orbiting spacecraft
N85-22234
HYPERVELOCITY PROJECTILES
Rail accelerator technology and applications
[NASA-TM-86947] N85-21258
Arc-driven rail gun research
[NASA-CR-174816] N85-21662
HYPOKINESIA
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats
N85-21944
Preventive effect of acute heat factors during hypokinesia N85-21945
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
HYPOXIA
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947

I

I BEAMS
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21716
IBM COMPUTERS
ZTL: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 IEEE-488 controller
[LA-10141-MS] N85-22010
DOS 21: PCDOS 2.0 support subroutine package for the IBM personal computer
[LA-10142-MS] N85-22012
TRANIO: A subroutine package for the IBM personal computer to support the transfer 6002 CAMAC crate controller
[LA-10145-MS] N85-22015
IDEAL GAS
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals
[NASA-TM-83800] N85-22204
IFF SYSTEMS (IDENTIFICATION)
A computer analysis of the RF performance of a ground-mounted, air-supported radome
[AD-P004352] N85-21446
IGNITERS
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
IGNITION
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
IGNITION LIMITS
Behavior of the lean methane-air flame at zero-gravity
[NASA-CR-175586] N85-21283
ILLINOIS
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures — Illinois N85-21731
ILLUMINATING
Power from the Sun: Light at night
[PB85-124097] N85-21814
IMAGE ANALYSIS
Image lobe analysis for large radomes
[AD-P004359] N85-21453
The use of linear feature detection to investigate Thematic Mapper data performance and processing
N85-21740
IMAGE DISSECTOR TUBES
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
IMAGE INTENSIFIERS
STS atmospheric luminosities
[NASA-CR-175514] N85-21240
IMAGE MOTION COMPENSATION
Processing dynamic image sequences from a moving sensor
[AD-A149984] N85-22148
IMAGE PROCESSING
Wide-field-of-view, helmet-mounted infinity display system development
[AD-A149641] N85-21159
Imaging apparatus for transverse electrode electro-optic tunable filter
[AD-D011524] N85-21497
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
The use of linear feature detection to investigate Thematic Mapper data performance and processing
N85-21740
The development of image processing of NOAA AVHRR data and its application to sea surface temperature
N85-21891
Instrumentation award
[AD-A150081] N85-21999
Processing dynamic image sequences from a moving sensor
[AD-A149984] N85-22148
Electron image simulation: A complementary processing technique
[DE85-000685] N85-22190
IMAGE RESOLUTION
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
TM geometric performance: Line to Line Displacement Analysis (LLDA) — New Mexico N85-21732
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
Processing dynamic image sequences from a moving sensor
[AD-A149984] N85-22148
IMAGERY
Radar calibration using direct measurement equipment and oblique photometry
[AD-D011530] N85-21433
IMAGES
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612
Determining object orientation from a single image using multiple information sources
[AD-A149980] N85-22146

IMAGING TECHNIQUES
Multiparticle 3D imaging technique to study the structure of molecular ions
[DE85-001843] N85-22122
IMIDES
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-2] N85-21347
IMPACT
Impacts on Explorer 46 from an Earth orbiting population N85-21204
IMPACT DAMAGE
Orbital Debris
[NASA-CP-2360] N85-21186
A model for the evolution of on-orbit manmade debris environment N85-21196
Geosynchronous satellite collision avoidance N85-21197
In situ orbital debris experiment concepts N85-21198
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
IMPACT LOADS
Biological effects of blast and impact waves
[FOA-C-52006-H4-D7] N85-21968
IMPACT PREDICTION
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9680-SR] N85-22131
IMPACT RESISTANCE
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
IMPACT TESTS
Development of a high temperature single impact rain erosion test capability
[AD-P004371] N85-21465
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
IMPACT TOLERANCES
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile
[NASA-TM-85904] N85-21245
IMPEDANCE MATCHING
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632
IMPURITIES
Electrochemical processes at the sodium (BETA)" alumina interface
[DE85-004653] N85-21305
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170
INCOHERENCE
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504
INCOMPRESSIBLE FLOW
A three-dimensional spectral algorithm for simulations of transition and turbulence
[NASA-CR-172561] N85-21575
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
INCOMPRESSIBLE FLUIDS
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
INCONEL (TRADEMARK)
Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties
[NASA-CR-174841] N85-21320
INDEXES (DOCUMENTATION)
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 267, January 1985
[NASA-SP-7011(267)] N85-21959
The intelligent database machine N85-22242
Medical subject headings, tree structures, 1985
[PB84-216092] N85-22261
Permuted medical subject headings, 1985
[PB84-216100] N85-22262
INDIAN SPACE PROGRAM
The space flight of the Soviet-Indian crew
[NASA-TM-77615] N85-21226
INDIUM
Low cost, sprayed CuInSe2 solar cell research
[DE85-003467] N85-21799
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2
[AD-A150131] N85-22187
INDIUM ARSENIDES
Evaluation of implantation-disordering of (InGa)As/GaAs strained-layer superlattices
[DE85-003533] N85-22200
INDUCTANCE
Plasma mass and effective inductance in a small rainbow
[MRL-R-947] N85-22162
INDUCTION MOTORS
Solar powered actuator with continuously variable auxiliary power control
[NASA-CASE-MFS-25637-1] N85-21769
INDUCTORS
Characteristics of the boat inductor for keeping liquid metal in the suspended state
[NASA-TM-77816] N85-21611
INDUSTRIAL PLANTS
Aviation repair plant directors on quality control measures N85-21106
INDUSTRIES
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
Cost comparison of small gas turbines versus electric motors in a variable load industrial application
[PB85-149763] N85-21530
The future of lightwave technology
[PB85-109759] N85-22155
INELASTIC SCATTERING
Theoretical nuclear physics
[DE85-003466] N85-22135
INELASTIC STRESS
3-D inelastic analysis methods for hot section components (base program) — turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
INERTIAL FUSION (REACTOR)
Opacity determinations for Inertial Confinement Fusion (ICF) materials using an average atom model N85-22295
INERTIAL GUIDANCE
Distance-inertial guidance of launch vehicle described N85-21417
INFORMATION
Report on the Second Annual Review Meeting of the National Acid Precipitation Assessment Program. Research to assist decisionmaking: Summary
[DE85-003003] N85-21820
INFORMATION DISSEMINATION
Computer and communications security and privacy
[GPO-39-741] N85-21994
INFORMATION FLOW
Model of information-reference dialogue system for working with document abstracts N85-21949
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254
INFORMATION RETRIEVAL
Model of information-reference dialogue system for working with document abstracts N85-21949
The EEC's information technology program: An update
[AD-A150022] N85-22258
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260
INFORMATION SYSTEMS
Model of information-reference dialogue system for working with document abstracts N85-21949
The EEC's information technology program: An update
[AD-A150022] N85-22258
INFRARED ABSORPTION
An analysis of the data obtained by a simultaneous observation of GMS and GMS-2: A study of the difference between the brightness temperatures by GMS and those by GMS-2 N85-21888
VISSR infrared calibration by means of calculated radiances N85-21889
INFRARED DETECTORS
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Monolithic short wave infrared (SWIR) detector array
[NASA-CR-175284] N85-21759
INFRARED IMAGERY
LANDSAT 4 band 6 data evaluation
[E85-10093] N85-21755
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
A supplement study on the subsynoptic cloud system off the south coast of Japan N85-21892
INFRARED INSPECTION
Characterization of the heat source distribution of a typical GTAW welding arc
[DE85-004322] N85-21670
INFRARED INSTRUMENTS
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143
INFRARED INTERFEROMETERS
A Jamin interferometer to determine the helium abundance in the atmosphere of Jupiter
[BONN-IR-83-17] N85-22329
INFRARED RADIATION
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288
Progress on transparent yttria
[AD-P004370] N85-21464
Infrared material optical damage by rain
[AD-P004372] N85-21466
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154
INFRARED SCANNERS
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143
INFRARED SPECTRA
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150
IRAS observations of Seyfert galaxies
[NASA-CR-175557] N85-22267
INFRARED SPECTROSCOPY
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149813] N85-21291
INFRASONIC FREQUENCIES
Seismic observation of infrasonic signals
[AD-A149574] N85-21853
Some individual differences in human response to infrasound
[UTIAS-282] N85-21960
INGOTS
Nondestructive testing of stainless steel to improve quality and output efficiency of the processing of ingot and continuous casting
[BMFT-FB-T-84-240] N85-21345
INORGANIC CHEMISTRY
The synthesis, structural characterization and reactions of closo-Rhodacarborane Anions containing a formal d8 metal vertex 1,2
[AD-A149640] N85-21285
INSOLATION
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802
INSPECTION
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
The state of the art in printed wiring board inspection
[AD-A149871] N85-21679
INSTRUMENT COMPENSATION
Compensation of skew passband of a SAW filter using predistortion N85-21422
INSTRUMENT ERRORS
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
On the wind error of the Finnish raingauge
[REPT-37] N85-21883
INSULATION
International Conference on Defects in Insulating Crystals
[AD-A149611] N85-22180
INSULIN
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rheseus monkeys N85-21946
INTAKE SYSTEMS
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178

INTEGRAL EQUATIONS
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation [PB85-110831] N85-21528
Noise transmission loss of a rectangular plate in an infinite baffle [NASA-TP-2398] N85-22109

INTEGRAL TRANSFORMATIONS
A note on the use of polynomial transformations in evaluating singular integrals [MATHEMATICS-RESEARCH-165] N85-22053
The implementation of the Tanh transformations in the evaluation of singular integrals [MATHEMATICS-RESEARCH-171] N85-22054

INTEGRALS
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity [NASA-CR-174872] N85-21685

INTEGRATED CIRCUITS
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor [AD-D011500] N85-21494
Monolithic thin film SAW (Surface Acoustic Wave) structures [AD-A149782] N85-21511
Concurrent simulation techniques exploiting hierarchy [AD-A149783] N85-21512
Design of a bit-sliced processor array with built-in-self-test [AD-A149785] N85-21513
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability [AD-A150004] N85-21515
Universal file processing program for field programmable integrated circuits [DE85-004384] N85-21526
Built-in tests for VLSI (Very Large Scale Integration) finite-state machines [AD-A149784] N85-21997

INTEGRATED OPTICS
Technological and economic assessment of advanced ceramic materials. Volume 1: Summary and conclusions [PB85-113082] N85-21383
Technological and economic assessment of advanced ceramic materials: Volume 4: A case study of integrated optic devices [PB85-113116] N85-21385
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools [PB85-113132] N85-21387

INTELLIGENCE
Transfer of technology [S-REPT-98-664] N85-22246

INTENSITY
Effect of stationary magnetic field on bleeding time N85-21956

INTERCALATION
Investigation of electric and magnetic properties of intercalated graphite [AD-A149801] N85-21274
Electric and magnetic properties of intercalated graphite [AD-A149648] N85-21276
Neutron scattering studies of graphite intercalation compounds [DE85-003079] N85-22196

INTERCEPTION
Modeling interception of rainfall by forests and the role of interception in the water balance [DE85-002822] N85-21825

INTERFACES
Electrochemical processes at the sodium (BETA)" alumina interface [DE85-004653] N85-21305
DOS 21: PCDOS 2.0 support subroutine package for the IBM personal computer [LA-10142-MS] N85-22012
ZTLCK: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 real time clock [LA-10146-MS] N85-22014
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised [AD-A149948] N85-22024
A formal method for specifying computer resources in an implementation independent manner [AD-A149955] N85-22043
Numerical methods for tracking interfaces [LA-9917-MS] N85-22052
Nucleation of phase transitions in the vicinity of phase boundary. Part 1: Comparison of various idolated mechanisms. Part 2: Coupled cluster growth processes [N-0208-5658] N85-22174

INTERFACIAL TENSION
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles [DE85-004319] N85-21306
Tribological properties of boron nitride synthesized by ion beam depoeition [NASA-TM-86962] N85-21355

INTERFERENCE
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2) [AD-A150123] N85-21126

INTERLAYERS
Stress-relieving interlayers for bituminous resurfacings [PB85-136885] N85-21415

INTERMEDIATE FREQUENCIES
Digital coherent detector [AD-D011560] N85-21501

INTERMETALLICS
Alloys based on NiAl for high temperature applications [NASA-TM-86976] N85-21322
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds [AD-A150000] N85-22183
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2 [AD-A150131] N85-22187

INTERNAL COMBUSTION ENGINES
Stratified charge rotary aircraft engine technology enablement program [NASA-CR-174812] N85-21163

INTERNAL CONVERSION
Inelastic scattering in condensed matter with high intensity Moessbauer radiation [DE85-003531] N85-21627

INTERNAL WAVES
The imaging of internal waves by the SEASAT-A synthetic aperture radar [AD-A149808] N85-21761
Circulation and internal waves in a cold Gulf Stream waves [AD-A149704] N85-21918

INTERNATIONAL RELATIONS
Technology transfer to the Middle East [PB85-127744] N85-22264

INTERNATIONAL TRADE
Transfer of technology [S-REPT-98-664] N85-22246
Transfer of technology [S-HRG-98-996] N85-22247

INTERORBITAL TRAJECTORIES
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories [NASA-TM-86946] N85-21228

INTERPOLATION
Scattered data interpolation using thin plate splines with tension [AD-A149803] N85-21705
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2 [AD-A150131] N85-22187

INTERSTELLAR MAGNETIC FIELDS
Some constraints on magnetic fields in galactic spiral arms N85-22300

INTERSTELLAR RADIATION
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories [NASA-TM-86946] N85-21228
Pulsars and interstellar medium N85-22320

INTERSTELLAR SPACE
Pulsars and interstellar medium N85-22320

INTERSTITIALS
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys [DE85-001285] N85-22193

INTESTINES
Dynamics of quantitative and qualitative changes in conditionally pathogenic microflora of the human intestine during long-term hypokinesia N85-21953

INVARIANCE
Invariant differential operators on a semisimple symmetric space and finite multiplicities in a Plancherel formula [CWI-PM-R8409] N85-22094

INVERSE SCATTERING
Nonlinear sigma-models and integration methods [DE85-004447] N85-22071

INVERSIONS
On the inversion of the lidar equation [AD-A149553] N85-21641
Determining conductivity by boundary measurements. Part 2: Interior results [AD-A149750] N85-22083

IODINE LASERS
Optically pumped iodine monofluoride laser [AD-D011555] N85-21637

ION ACCELERATORS
Theoretical study of collective ion acceleration in the Luce diode [AD-A150107] N85-22116
Workshop on Nuclear Dynamics 3 [INC-40007-24] N85-22130

ION ACOUSTIC WAVES
Arguments for fundamental emission by the parametric process L yields T + S in interplanetary type III bursts — langmuir, electromagnetic, ion acoustic waves (L, T, S) N85-22311

ION ATOM INTERACTIONS
Vacancy-rearrangement theory in the first Magnus approximation [DE85-004435] N85-22123

ION BEAMS
Diamondlike flakes [NASA-CASE-LEW-13837-2] N85-21267
Ion-beam nitriding of steels [NASA-CASE-LEW-14104-1] N85-21324
Sputter-induced compositional modifications in a Ni-Au alloy [DE85-002771] N85-21333
New high resolution scanning ion microprobe and focused ion beam applications [AD-A149992] N85-21616
Beam loss due to the aperture limitation resulting from intrabeam scattering [DE85-005138] N85-22124

ION CURRENTS
Solid electrolytes: Mechanisms for achieving optimal conductivity [AD-A150116] N85-21296

ION DENSITY (CONCENTRATION)
Development of Faraday cup onboard MS-T5 for solar wind measurements [REPT-616] N85-21255
Ionic mechanisms of soot formation in flames [AD-A150119] N85-21297
Study of electric field and ion effects on HVDC lines [DE85-002975] N85-21503
Theoretical study of collective ion acceleration in the Luce diode [AD-A150107] N85-22116

ION EXCHANGING
Solid electrolytes: Mechanisms for achieving optimal conductivity [AD-A150116] N85-21296

ION EXTRACTION
Reconsideration of sheath related to negative ion extraction [IPPJ-706] N85-22159

ION IMPLANTATION
Effects of B, Ti and Ta implantation on the wear resistance of Fe and Ni-plated Fe [AD-A149947] N85-21330
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys [DE85-001285] N85-22193
Evaluation of implantation-disordering of (InGa)As/GaAs strained-layer superlattices [DE85-003533] N85-22200

ION MICROSCOPES
New high resolution scanning ion microprobe and focused ion beam applications [AD-A149992] N85-21616

ION PLATING
Tribological properties of boron nitride synthesized by ion beam deposition [NASA-TM-86962] N85-21355

ION PROPULSION
Ring-cusp ion thruster with shell anode [NASA-CASE-LEW-13881-1] N85-21256

ION SOURCES
Theoretical study of collective ion acceleration in the Luce diode [AD-A150107] N85-22116

ION TEMPERATURE
Development of Faraday cup onboard MS-T5 for solar wind measurements [REPT-616] N85-21255
Ionic mechanisms of soot formation in flames [AD-A150119] N85-21297

IONIC COLLISIONS
Bibliography of atomic and molecular processes, 1983 [DE85-000662] N85-22121
Multiparticle 3D imaging technique to study the structure of molecular ions [DE85-001843] N85-22122
Vacancy-rearrangement theory in the first Magnus approximation [DE85-004435] N85-22123

IONIC REACTIONS
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
IONIZATION GAGES
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3874] N85-21675
IONIZED GASES
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
IONOSPHERE
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859
IONOSPHERIC DISTURBANCES
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846
IONOSPHERIC ELECTRON DENSITY
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846
Rocket observations of the ionosphere during the eclipse of 26 February 1979
[NASA-CR-175513] N85-21850
IONOSPHERIC PROPAGATION
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859
IONOSPHERIC SOUNDING
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846
IONS
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160
Strong iron accelerating by collisionless magnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
Velocity distributions of solar wind ions and electrons N85-22273
IOWA
Scan angle and detector effects in Thematic Mapper radiometry — Iowa and Arkansas N85-21735
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
IRIDIUM
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286
IRON ALLOYS
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27
[NASA-TP-2443] N85-21323
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
IRON CHLORIDES
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004184] N85-22197
IRON COMPOUNDS
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195
IRRADIATION
Irradiation effects on fuels for space reactors
[DE84-016460] N85-22134
ISLANDS
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117984] N85-21869
ISOCYANATES
Fluorinated polyurethanes
[AD-D011526] N85-21353
ISOTHERMAL FLOW
Theoretical and experimental investigations of dust loaded flow fields in industrial halls
[BMFT-FB-HA-84-044] N85-21411
ISOTOPIC LABELING
Los Alamos MINI-Review: Tracking Antarctic winds
[DE85-004597] N85-21903
ITERATION
A solution method for large deformation contact problems
[AD-A149842] N85-21707
State dependent priority rules for scheduling
[AD-A149972] N85-22090
An iteration method for complex scattering problems
[AD-A150036] N85-22151

J

J INTEGRAL
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity
[NASA-CR-174872] N85-21685
JAMMING
Multiple loop sidelobe canceller
[AD-D011533] N85-21434
The effect of jamming/deception on decision making
[AD-A149740] N85-21472
JAPAN
High-technology ceramics in Japan
[PB85-125020] N85-21389
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254
JAPANESE SPACE PROGRAM
Meteorological Satellite Center Technical Note No. 10, 1984
[MSC-TN-10] N85-21884
JET AIRCRAFT
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171
JET ENGINE FUELS
Oxidation and gum formation in jet fuels
[AD-A149934] N85-21401
JET FLOW
Preliminary analysis of tone-excited two-stream jet velocity decay
[NASA-TM-86951] N85-21114
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
JET MIXING FLOW
An experimental investigation of an underexpanded rectangular jet ejector
[AD-A149656] N85-21170
JET PROPULSION
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
JFET
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
JIMSPHERE BALLOONS
Atmospheric environment for Space Shuttle (STS-51A) launch
[NASA-TM-86497] N85-21875
JOINTS (JUNCTIONS)
Characterization of mode 1 and mixed-mode failure of adhesive bonds between composite adherends
[NASA-TM-86355] N85-21270
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11543-1] N85-21986
JORDAN FORM
The eigenstructure assignment of deadbeat control systems
[AD-A149761] N85-21510
JOSEPHSON JUNCTIONS
Thin film technology of high-critical-temperature superconducting electronics
[AD-A150010] N85-22185
JUDGMENTS
Task influences in the analytic-intuitive approach to decision making
[AD-A149870] N85-22250
JUPITER ATMOSPHERE
Particle transport in planetary magnetospheres N85-22275
A Jamin interferometer to determine the helium abundance in the atmosphere of Jupiter
[BONN-IR-83-17] N85-22329

K

KELVIN-HELMHOLTZ INSTABILITY
Magnetohydrodynamic (MHD) turbulence in radio galaxies N85-22305
KERNEL FUNCTIONS
An asymptotically efficient solution to the bandwidth problem of kernel density estimation, revision
[AD-A149600] N85-22056
KEVLAR (TRADEMARK)
A broadband kevlar radome for shipboard
[AD-P004365] N85-21459
KINEMATICS
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Mechanical properties for the grasp of a robotic hand
[AD-A150082] N85-21669
KINETIC ENERGY
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
KNOWLEDGE
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612
KONDO EFFECT
Green's function solution of the Kondo problems and universality of the thermodynamic properties
[DE85-002739] N85-22206

L

LABORATORIES
JPL highlights, 1983
[NASA-CR-175558] N85-22256
LAGRANGE MULTIPLIERS
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
LAKES
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21829
LAMINAR BOUNDARY LAYER
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
LAMINAR FLOW
Flight-measured laminar boundary-layer transition phenomena including stability theory analysis
[NASA-TP-2417] N85-21118
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
Kinetics of nitric oxide formation in laminar and turbulent methane combustion
[PB85-149698] N85-21313
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149851] N85-21582
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
Computer-Aided Structural Engineering (CASE) project. Seepage analysis of confined flow problems by the method of fragments (CFRAG)
[AD-A150015] N85-21762
Hydrodynamic stability problem formulated by numerical solutions of the Navier-Stokes equations N85-22223
LAMINAR WAKES
The mechanisms of flame holding in the wake of a bluff body
[NASA-CR-3866] N85-21166
LAMINATES
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269
Accelerated viscoelastic characterization of T300-5208 graphite-epoxy laminates
[NASA-CR-3871] N85-21271
Fire and heat resistant laminating resins based on maleimido and citraconimido substituted 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diaminobenzenes
[NASA-CASE-ARC-11533-1] N85-21364
Study of laminated dielectric behavior at microwave and millimeter-wave frequencies
[AD-P004358] N85-21452
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213

Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238

LAND USE
Building a functional, integrated GIS/remote sensing resource analysis and planning system — Utah [E85-10092] N85-21754

LANDFILLS
Assessment of hazardous waste surface impoundment technology case studies and perspectives of experts [PB85-117059] N85-21834

LANDING GEAR
Deflection model of a CT4-A undercarriage [AD-A149778] N85-21156

LANDING RADAR
Landing control centrals [AD-A149800] N85-21140

LANDSAT 4
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM) [E85-10069] N85-21724
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
A preliminary assessment of LANDSAT-4 Thematic Mapper data — Windsor, Ontario and Medicine Hat areas, Canada N85-21728
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
TM geometric performance: Line to Line Displacement Analysis (LLDA) — New Mexico N85-21732
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors — New Mexico N85-21733
LANDSAT-4 Thematic Mapper calibration and atmospheric correction N85-21734
MTF analysis of LANDSAT-4 Thematic Mapper N85-21737
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
The use of linear feature detection to investigate Thematic Mapper data performance and processing N85-21740
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746
LANDSAT 4 band 6 data evaluation [E85-10093] N85-21755

LANGUAGE PROGRAMMING
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240

LANGUAGES
Glossary of the soil sciences [PB85-133452] N85-22263

LANTHANUM COMPOUNDS
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12 [DE85-003724] N85-22195

LAPLACE TRANSFORMATION
Application of the system identification technique to goal-directed saccades [AD-A150132] N85-21967

LARGE SPACE STRUCTURES
Modal control of structural systems [AD-A149734] N85-21235
NASA/MSFC ground experiment for large space structure control verification [NASA-TM-86496] N85-21248
Definition of ground test for Large Space Structure (LSS) control verification [NASA-TM-86495] N85-21249
Space Station [NASA-EP-211] N85-21251
ACOSS 17 (Active Control of Space Structures) [AD-A150007] N85-21253
Structural sensitivity analysis: Methods, applications and needs [NASA-TM-85827] N85-21695
Variable geometry truss concept [REPT-614] N85-21697

LASER ANEMOMETERS
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
Development of miniature laser Doppler anemometers [KU-SFB-210/ET/3] N85-21648

LASER APPLICATIONS
Novel photo-thermal technique for flow and spectroscopic measurements in a dense aerosol stream [AD-A149745] N85-21287
Two-dimensional measurements of OH concentration and temperature in reactive flows [AD-A149849] N85-21292
Portable remote laser sensor for methane leak detection [NASA-CASE-NPO-15790-1] N85-21631
Laser clock [AD-D011513] N85-21634
Method of and apparatus for measuring temperature and pressure — atmospheric sounding [NASA-CASE-GSC-12558-1] N85-21639

LASER CAVITIES
Axial flow laser cavity [AD-D011506] N85-21633

LASER DAMAGE
A study of low-level laser retinal damage [AD-A150046] N85-21965

LASER DOPPLER VELOCIMETERS
Solid particle receiver experiments: Velocity measurements [DE85-000257] N85-21623
Development of miniature laser Doppler anemometers [KU-SFB-210/ET/3] N85-21648

LASER INTERFEROMETRY
Technical support for microwave experiments on the eye lens [AD-A149702] N85-22144

LASER MATERIALS
Advanced crystalline laser materials [DE85-003142] N85-21647

LASER OUTPUTS
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor [AD-A150111] N85-21295
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system [NASA-CR-174839] N85-21604
Transmission and reflection of laser beams propagating through aerosol clouds in space [LA-9998-MS] N85-21638
Dynamics of space charge waves in the laser beat wave accelerator [AD-A149688] N85-22163

LASER PLASMAS
Development and application of low energy X-ray and electron physics [AD-A149983] N85-22099

LASER PUMPING
The effects of surface waves on RF discharge pumped lasers [AD-A149689] N85-21643

LASER STABILITY
The effects of surface waves on RF discharge pumped lasers [AD-A149689] N85-21643

LASER TARGETS
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation [DE85-001742] N85-21621

LASERS
Photoacoustic effect and its applications N85-21421
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly [DE85-003260] N85-21582
Multiple double heterojunction buried laser device [AD-D011519] N85-21635
State-selected ion-molecule reaction dynamics [AD-A150068] N85-22115

LATEX
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187

LAUNCH VEHICLES
Commercial space launches [S-REPT-98-656] N85-21225
Distance-inertial guidance of launch vehicle described N85-21417

LAUNCHERS
Electromagnetic rail launcher as a circuit element [AD-A150067] N85-21516

LEADING EDGES
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423

LEAKAGE
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products [AD-A149777] N85-21368
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines [NASA-TM-86928] N85-21569
Carbon granule probe microphone for leak detection — recovery boilers [NASA-CASE-NPO-16027-1] N85-21597
Leak detectors for organic Rankine cycle power plants: On-line and manual methods [DE85-002792] N85-21617
Portable remote laser sensor for methane leak detection [NASA-CASE-NPO-15790-1] N85-21631

LEARNING
Learning to search. From weak methods to domain-specific heuristics [AD-A149949] N85-22045

LEAST SQUARES METHOD
Estimation of the impulse response of television channels from digitized waveforms [CRC-1376] N85-21429
On the accuracy of least squares methods in the presence of corner singularities [NASA-CR-172552] N85-22050
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2 [AD-A150131] N85-22187

LEGENDRE FUNCTIONS
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths [NASA-TM-86379] N85-21874

LENS ANTENNAS
3-D Dome/Rotman lens antenna breadboard demonstration [AD-A149809] N85-21475

LENSES
Technical support for microwave experiments on the eye lens [AD-A149702] N85-22144
Properties of chirped grating lenses in optical waveguides [AD-A150023] N85-22149

LETHALITY
Systems vulnerability and lethality in the development phase [AD-A149737] N85-22089

LEVEL (QUANTITY)
Oscillator development [AD-A149699] N85-21509

LEVITATION MELTING
High temperature acoustic levitator [NASA-CASE-NPO-16022-1] N85-22105

LIBRARIES
Parallel linear algebra library for the Denelcor HEP [DE85-004685] N85-22034

LICENSING
Commercial space launches [S-REPT-98-656] N85-21225

LIE GROUPS
Invariant differential operators on a semisimple symmetric space and finite multiplicities in a Plancherel formula [CWI-PM-R8409] N85-22094
Asymptotic behavior of matrix coefficients related to reductive symmetric spaces [CWI-PM-R8410] N85-22095

LIFE (DURABILITY)
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data [AD-A149810] N85-21275
Plasticizer system for propellant compositions [AD-D011502] N85-21390
Plasticizer system for propellant compositions [AD-D011508] N85-21391
Plasticizer system for propellant compositions [AD-D011514] N85-21393
Plasticizer system for propellant compositions [AD-D011517] N85-21395
Life study of RF excited Hg arc lamps and CO2 waveguide lasers [AD-A149618] N85-21640

LIFE SCIENCES
Research and technology activities at Ames Research Center's Biomedical Research Division [NASA-TM-86692] N85-21925

LIFT DEVICES
Three-dimensional unsteady lifting surface theory in the subsonic range [NASA-TM-77812] N85-21111

LIGHT EMISSION
Formation of optical-line emitting regions in the jets of SS433 N85-22318
LIGHT EMITTING DIODES
1.5 to 1.7 micrometers LEDs (Light-Emitting Diode) [AD-A149685] N85-21508
Transistor-transistor logic microcircuit tester N85-21556
Focal plane array optical proximity sensor [NASA-CASE-NPO-15155-1] N85-22139
LIGHT MODULATION
Switchable zero order diffraction gratings as light valves [AD-A150129] N85-22153
LIGHT SCATTERING
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system [NASA-CR-174839] N85-21604
Transmission and reflection of laser beams propagating through aerosol clouds in space [LA-9998-MS] N85-21638
On the inversion of the lidar equation [AD-A149653] N85-21641
LIGHT TRANSMISSION
Improvements in glazings: SERI materials research in progress [DE84-013049] N85-21378
Transmission and reflection of laser beams propagating through aerosol clouds in space [LA-9998-MS] N85-21638
Temperature-insensitive optical fibers [AD-D011551] N85-22142
LIGHT VALVES
Switchable zero order diffraction gratings as light valves [AD-A150129] N85-22153
LIGHTNING
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982 [NASA-TM-86347] N85-21877
Collection and use of lightning strike data in the western US during summer 1983 [PB85-110534] N85-21907
Preliminary results of associating cloud-to-ground lightning with surface convergence and radar reflectivity at Kennedy Space Center in 1983 [NASA-CR-175543] N85-21910
LIGNITE
Alternative anodic reactions in water splitting [DE85-004159] N85-21300
LINE SHAPE
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples [AERE-R-10549] N85-22173
LINE SPECTRA
Formation of optical-line emitting regions in the jets of SS433 N85-22318
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980 [NASA-CR-175544] N85-22334
LINEAR ACCELERATORS
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths [DE85-000682] N85-21646
Single-cavity SLED device [DE85-002587] N85-22117
LINEAR PROGRAMMING
Automatic control design procedures for restructurable aircraft control [NASA-CR-172489] N85-21173
Parallel linear algebra library for the Denelcor HEP [DE85-004685] N85-22034
Needs, opportunities, and options for large scale systems research [DE85-004642] N85-22091
LINEAR SYSTEMS
Low sidelobe phased array antenna system [AD-D011558] N85-21435
Methods of progressing waves in turbulent media with applications to acoustics [AD-A149599] N85-22055
LINEARITY
New results on the PLL false lock phenomenon N85-22236
LININGS
Advanced liner-cooling techniques for gas turbine combustors [NASA-TM-86952] N85-21115
Shallow land burial technology: Humid [DE85-004432] N85-22136
LINKS (MATHEMATICS)
On ergodic actions whose self-joinings are graphs [CWI-PM-R8408] N85-22093
LIPOPROTEINS
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944
LIQUEFIED NATURAL GAS
Mechanisms of heat and mass transfer across a double-diffusive interface [PB85-148468] N85-21594
LIQUID COOLING
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
LIQUID CRYSTALS
A brief review of the technology of microemulsions and other micellar systems [AD-A149759] N85-21289
LIQUID HYDROGEN
An air-breathing ballistic space transporter for Europe [NASA-TM-77645] N85-21244
LIQUID METALS
Characteristics of the boat inductor for keeping liquid metal in the suspended state [NASA-TM-77816] N85-21611
LIQUID OXYGEN
An air-breathing ballistic space transporter for Europe [NASA-TM-77645] N85-21244
LIQUID PHASE EPITAXY
Preparation of crystal growth experiments in Spacelab: Si (FSLP), CdTe (D1), ZnS (D1) [BMFT-FB-W-84-045] N85-21227
LIQUID ROCKET PROPELLANTS
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base [RAD-84-203-001-80-21] N85-21230
LISP (PROGRAMMING LANGUAGE)
The portable LISP translation tool [AD-A149765] N85-22023
LITHIUM
Negative lithium emission from a tungsten surface in a plasma [DE85-003456] N85-22167
LITHIUM COMPOUNDS
Neutron scattering studies of graphite intercalation compounds [DE85-003079] N85-22196
LITHIUM SULFUR BATTERIES
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries [DE85-004345] N85-21525
LITHOLOGY
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications — Drum Mountains, Utah and Tonopath, Nevada [E85-10095] N85-21757
LOADS (FORCES)
Techniques to analyze vehicle coastdown data [DE85-005159] N85-21127
Characterization of lubricated bearing surfaces operated under high loads [NASA-TM-86964] N85-21357
Cost comparison of small gas turbines versus electric motors in a variable load industrial application [PB85-149763] N85-21530
Ring-on-ring tests and load capacity of cladding glass [PB85-106391] N85-21717
Reliability of structural brittle materials N85-22222
LOFTING
Semianalytic modeling of aerodynamic shapes [NASA-TP-2413] N85-21120
LOGIC CIRCUITS
Transistor-transistor logic microcircuit tester N85-21556
LOGIC PROGRAMMING
Characterizing the parallelism in rule-based expert systems [DE85-002432] N85-22047
Evaluation of expert systems N85-22229
LOGICAL ELEMENTS
The automated reasoning system ITP [ANL-84-27] N85-22016
LOGISTICS MANAGEMENT
On maximizing the expected lifetime of replaceable systems [AD-A150003] N85-21680
LONG DURATION SPACE FLIGHT
NASA welding assessment program [NASA-CR-175512] N85-21661
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
LONGERONS
The residual strength of cracked specimens representing a section of the mirage into wing main spar [ARL-STRUC-R-408] N85-21699
LOOPS
Wideband phase keyers N85-21544
New results on the PLL false lock phenomenon N85-22236
LORENTZ FORCE
Update of thermal conductivity and electrical resistivity of electrolytic iron, tungsten and stainless steel [PB85-115814] N85-21311
LORENTZ GAS
Heat flux in Lorentzian plasma [IPPJ-704] N85-22158
LOSSES
The effect of jamming/deception on decision making [AD-A149740] N85-21472
Reducing electric power losses in discharge chamber of induction plasmatron N85-21553
Beam loss due to the aperture limitation resulting from intrabeam scattering [DE85-005138] N85-22124
LOSSY MEDIA
Numerical methods for analyzing electromagnetic scattering [NASA-CR-175507] N85-21438
LOW COST
Low cost, sprayed CuInSe2 solar cell research [DE85-003467] N85-21799
LOW DENSITY MATERIALS
X-ray gauge measures areal density variations as small as 0.1% [DE85-003774] N85-21629
LOW FREQUENCIES
L.F. RADIO-DATA: Specification of BBC phase-modulated transmissions on long-wave [BBC-RD-1984/19] N85-21431
Method of designing digital band-pass filters with infinite memory N85-21546
LOW PASS FILTERS
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft [AD-A149690] N85-22143
LOW TEMPERATURE
Low temperature deposition of nickel films [AD-D011568] N85-21319
Oscillator development [AD-A149699] N85-21509
LOWER BODY NEGATIVE PRESSURE
LBNP training of crew members on main missions aboard Salyut-6 orbital station N85-21938
LUBRICANTS
Characterization of lubricated bearing surfaces operated under high loads [NASA-TM-86964] N85-21357
LUBRICATION
Tribological systems as applied to aircraft engines [NASA-TM-86965] N85-21657
Lubrication and performance of high-speed rolling-element bearings [NASA-TM-86958] N85-21658
LUMINANCE
Television camera video level control system [NASA-CASE-MSC-18578-1] N85-21427
LUMINESCENCE
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting [DE85-002503] N85-21185
LUMINOSITY
STS atmospheric luminosities [NASA-CR-175514] N85-21240
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions [DE85-000887] N85-22192
IRAS observations of Seyfert galaxies [NASA-CR-175557] N85-22267
Plasma in the clusters of galaxies N85-22299
LUMINOUS INTENSITY
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system [NASA-CR-174839] N85-21604
LUMPING
Acoustic agglomeration methods and apparatus [NASA-CASE-NPO-15466-1] N85-22104
LUNAR MAGNETIC FIELDS
Magnetospheres in the solar system N85-22274
LUNGS
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures [AD-A150100] N85-21966

M

MACH REFLECTION
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577

MACHINE TOOLS
Technological and economic assessment of advanced ceramic materials: Volume 4: A case study of integrated optic devices
[PB85-113116] N85-21385
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools
[PB85-113132] N85-21387

MACHINING
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681

MAGMA
Shallow magma targets in the western US
[DE85-003274] N85-21803

MAGNESIUM CHLORIDES
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197

MAGNETIC CHARGE DENSITY
New types of power supplies for ultrasonic processing equipment N85-21566

MAGNETIC DIPOLES
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources
[AD-A149638] N85-21470

MAGNETIC FIELD CONFIGURATIONS
Dynamics of space charge waves in the laser beat wave accelerator
[AD-A149688] N85-22163
Forced recognition by nonlinear MHD waves and sequential triggering of solar flares N85-22291
The continuous spectrum of an axisymmetric, self-gravitating equilibrium in the presence of a poloidal magnetic field N85-22315

MAGNETIC FIELDS
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
Magnetic field in main gap of separator N85-21563
Behavior of small ferromagnetic particles in traveling magnetic field N85-21564
Rotating squid magnetometers and gradiometers
[AD-D011529] N85-21600
Betatron-synchrotron detrapping in a tapered wiggler free electron laser
[AD-A149686] N85-21642
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955
Effect of stationary magnetic field on bleeding time N85-21956
Superconducting magnet technology for accelerators
[DE85-004192] N85-22102
Strong iron accelerating by collisionless magnnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161

MAGNETIC FLUX
Magnetic field in main gap of separator N85-21563
Ultrasensitive measuring devices
[DE85-000672] N85-21622
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225
Equilibrium model of thin magnetic flux tubes — solar atmosphere N85-22310

MAGNETIC MATERIALS
Magnetic X-ray scattering studies of the rare Earth metal holmium
[DE85-003608] N85-21335
Metrology for Electronic Technology: A bibliography of NBS (National Bureau of Standards)
[PB85-112895] N85-21486
Green's function solution of the Kondo problems and universality of the thermodynamic properties
[DE85-002739] N85-22206

MAGNETIC MIRRORS
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160
Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170

MAGNETIC MOMENTS
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194

MAGNETIC PERMEABILITY
Investigation of electric and magnetic properties of intercalated graphite
[AD-A149801] N85-21274

MAGNETIC PROPERTIES
Electric and magnetic properties of intercalated graphite
[AD-A149848] N85-21276

MAGNETIC RECORDING
Remote self-contained undersea monitor
[AD-D011520] N85-21599
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-80599] N85-21609

MAGNETIC STORMS
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861

MAGNETIC SUSPENSION
Characteristics of the boat inductor for keeping liquid metal in the suspended state
[NASA-TM-77816] N85-21611

MAGNETIC TAPES
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359
The 20:16 block code for digital recording and transmission channels
[BBC-RD-1985/1] N85-21443
Atmospheric handbook: Atmospheric data tables available on computer tape
[PB85-108512] N85-21867

MAGNETIC TRANSDUCERS
Electromagnetic Acoustic Transducers (EMATs) for erosion monitoring
[DE85-004834] N85-21628

MAGNETIZATION
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194

MAGNETOHYDRODYNAMIC FLOW
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004568] N85-22171

MAGNETOHYDRODYNAMIC GENERATORS
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report
[DE85-003715] N85-22169

MAGNETOHYDRODYNAMIC STABILITY
Activation of solar flares N85-22276
Signatures of the coelescence instability in solar flares N85-22293

MAGNETOHYDRODYNAMIC TURBULENCE
Magnetohydrodynamic (MHD) turbulence in radio galaxies N85-22305

MAGNETOHYDRODYNAMIC WAVES
Forced recognition by nonlinear MHD waves and sequential triggering of solar flares N85-22291
Nonlinear evolution of astrophysical Alfven waves N85-22294

MAGNETOHYDRODYNAMICS
Strong iron accelerating by collisionless magnnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-cometary and planetary studies
[NASA-CR-175490] N85-22331

MAGNETOMETERS
Rotating squid magnetometers and gradiometers
[AD-D011529] N85-21600

MAGNETOSPHERE
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271
Magnetospheres in the solar system N85-22274
Particle transport in planetary magnetospheres N85-22275
The axisymmetric pulsar magnetosphere N85-22279
Nonlinear waves in the magnetosphere of pulsars N85-22281
About static and dynamic solutions of the aligned rotator model — pulsar magnetospheres N85-22306
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313

MAGNETS
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225

MAGNITUDE
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21888

MAINTAINABILITY
Maintainability time standards for electronic equipment
[AD-A149684] N85-21507
Reliability analysis of automatic systems
[VTT-301] N85-21662
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems
[DE84-004521] N85-21770

MAINTENANCE
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366

MALES
Dynamics of quantitative and qualitative changes in conditionally pathogenic microflora of the human intestine during long-term hypokinesia N85-21953

MAN MACHINE SYSTEMS
Operations concept for the advanced automation system man-machine interface
[AD-A149797] N85-21139
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
The man-machine interface
[AD-A149971] N85-21989
An interactive environment for the development of an expert system in ZOG
[AD-A149954] N85-22025
Design of graphic displays in computerized systems
[AD-A150071] N85-22027
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248

MANAGEMENT INFORMATION SYSTEMS
An interactive environment for the development of an expert system in ZOG
[AD-A149954] N85-22025

MANAGEMENT PLANNING
Air Force satellite position management N85-21217
Computing Division two-year operational plan, FY 1984 - 1985
[LA-9978-MS] N85-22006

MANIPULATORS
A remotely controlled orbiting retriever N85-21212
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
Mechanical properties for the grasp of a robotic hand
[AD-A150062] N85-21669
Sensor control of robot arc welding N85-22233

MANNED SPACE FLIGHT
The space flight of the Soviet-Indian crew
[NASA-TM-77615] N85-21226

MANNED SPACECRAFT
Space Station
[NASA-EP-211] N85-21251

MANUAL
Standard analytical procedures of the NOAA National Analytical Facility, 1984-85: Extractable toxic organic compounds
[PB85-126282] N85-21840

MANUALS
Review of US manual of clinical aviation medicine N85-21957

MANUFACTURING
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
Speed and accuracy in automated manufacture
[DE85-003913] N85-21410
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668

MAPPING
Retinal information mapping system
[AD-D011531] N85-21601
Hybrid method of mapping and photogeodetic control network densification
[PB85-133775] N85-21788

Implementation of the computer program-system MOSS (Map Overlay and Statistical System) on a VAX-11 series computer under VMS
[AD-A149612] N85-22019

MAPS
Design issues in video disc map display
[AD-A149646] N85-21760

MARINE BIOLOGY
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926

MARINE CHEMISTRY
Gas-liquid chemistry of natural waters, volume 1
[DE85-002803] N85-21822

MARINE TECHNOLOGY
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922

MARKETING
High-technology ceramics in Japan
[PB85-125029] N85-21389

MARS SURFACE
Physiography of the Martian west equatorial uplift N85-22325
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326

MASS FLOW
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181

MASS SPECTRA
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250

MASS SPECTROMETERS
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
Analyses via automated mass spectrometry (MS/DS) N85-22227
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237

MASS SPECTROSCOPY
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 2: Program documentation, version 1.0
[PB85-116069] N85-21310
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616
Analyses via automated mass spectrometry (MS/DS) N85-22227

MASS TRANSFER
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594

MASSACHUSETTS
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738

MATCHED FILTERS
Fundamental limits to synchronization and tracking
[AD-A149823] N85-21504

MATCHING
Multichannel digital processing of wideband signals N85-21548

MATERIALS
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996

MATERIALS HANDLING
Metoxids/materials matrix of ultimate disposal techniques for spilled hazardous materials
[PB85-116853] N85-21833

MATERIALS RECOVERY
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828

MATERIALS SCIENCE
Technological and economic assessment of advanced ceramic materials. Volume 1: Summary and conclusions
[PB85-113082] N85-21383

MATHEMATICAL LOGIC
Universal file processing program for field programmable integrated circuits
[DE85-004384] N85-21526

MATHEMATICAL MODELS
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B099311L] N85-21171
ACOSS 17 (Active Control of Space Structures)
[AD-A150007] N85-21253
A computer analysis of the RF performance of a ground-mounted, air-supported radome
[AD-P004352] N85-21446
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
An investigation of compressible flows over open cavities including shear layer thickness effects
[AD-A150086] N85-21588
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings
[AD-A149748] N85-21704
Numerical simulation of static and dynamic shadow patterns using an atomistic description of crack initiation and propagation
[DE85-003226] N85-21715
User's guide to the TAMW wheat model as implemented on the IBM 360/195 computer
[E85-10084] N85-21749
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
Ordinary and proper location M-estimates for ARMA models, revised
[AD-A149705] N85-22061
A review of some aspects of robust inference for time series
[AD-A149706] N85-22062
A note on validity generalization procedures
[AD-A150065] N85-22065
Surface forward scattering and reflection
[AD-A150115] N85-22112
Singular asymptotic expansions in nonlinear rotordynamics N85-22218
A mathematical formulation of the problem of optimal use of ground resources for future space missions N85-22232
Computational mechanics: A perspective on problems and opportunities for increasing productivity and quality of engineering
[PB85-126106] N85-22252

MATHEMATICS
Experimental mathematics
[CWI-PM-R8411] N85-22096

MATRICES (MATHEMATICS)
Differentiating matrices for arbitrarily spaced grid points
[NASA-CR-172556] N85-22051
On the limiting empirical distribution function of the eigenvalues of a multivariate F matrix
[AD-A149618] N85-22065
Direct secant updates of sparse matrix factors
[DE85-004008] N85-22073
Asymptotic behavior of matrix coefficients related to reductive symmetric spaces
[CWI-PM-R8410] N85-22095

MATRIX MATERIALS
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-4] N85-21351
Method and apparatus for detecting acoustic emissions from metal matrix wire
[AD-D011556] N85-22107

MAXIMUM ENTROPY METHOD
Determination of experimental Tokamak plasma properties using maximum entropy analysis
[DE85-001723] N85-22165

MAXIMUM LIKELIHOOD ESTIMATES
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
Ordinary and proper location M-estimates for ARMA models, revised
[AD-A149705] N85-22061

MAXWELL EQUATION
The liner package: An incipient MHD capability for CCUBE
[LA-9969-MS] N85-22007
An iteration method for complex scattering problems
[AD-A150038] N85-22151
Nonlinear waves in the magnetosphere of pulsars N85-22281
Explosive transverse electric field and particle acceleration during magnetic collapse — cosmic plasma N85-22292

MEASURING INSTRUMENTS
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
Transistor-transistor logic microcircuit tester N85-21556
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
Self-charging metering and dispensing device for fluids
[NASA-CASE-MSC-20275-1] N85-21595

MECHANICAL DEVICES
Extended moment arm anti-spin device
[NASA-CASE-LAR-12979-1] N85-21147
Maintainability time standards for electronic equipment
[AD-A149684] N85-21507
Connection system — insuring against loss of a tool component without using multiple tethers
[NASA-CASE-MSC-20319-1] N85-21649
Mechanical properties for the grasp of a robotic hand
[AD-A150082] N85-21669

MECHANICAL PROPERTIES
Composite structural materials
[NASA-CR-175515] N85-21268
Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties
[NASA-CR-174841] N85-21320
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27
[NASA-TP-2443] N85-21323
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft
[NASA-CASE-LAR-12775-2] N85-21349
Broadband thermoplastic radomes
[AD-P004369] N85-21483
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings
[AD-A149748] N85-21704
Summary of recent research on mechanical behavior of polycrystalline solids
[DE85-004601] N85-22190
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238

MECHANICS (PHYSICS)
Computational mechanics: A perspective on problems and opportunities for increasing productivity and quality of engineering
[PB85-126106] N85-22252

MEDICAL SCIENCE
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925

MELTS (CRYSTAL GROWTH)
Total immersion crystal growth
[NASA-CASE-NPO-15800-2] N85-22178

MEMBRANES
Supported liquid membrane battery separators
[DE85-001031] N85-21519

MEMORY (COMPUTERS)
Automatic multi-banking of memory for microprocessors
[NASA-CASE-NPO-15295-1] N85-21992

MERCURY CADMIUM TELLURIDES
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
Theoretical interpretation of thermal arrest data from differential thermal analysis measurements N85-22241

MERIDIONAL FLOW
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231

MESOSCALE PHENOMENA
Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena
[PB85-137370] N85-21844

MESOSPHERE
Experiment for measuring electric fields within the sounding rocket project Energy Budget
[BMFT-FB-W-84-048] N85-21866

MESSAGE PROCESSING
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision
[AD-A149997] N85-22068

METABOLISM
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
Cosmonauts' blood plasma free amino acid levels during preflight training N85-21937

Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943

METAL COATINGS
Low temperature deposition of nickel films [AD-D011568] N85-21319

METAL COMPOUNDS
Phthalocyanine polymers [NASA-CASE-ARC-11413-1] N85-21348
Metal (11) 4,4',4',4''-phthalocyanine tetraamines as curing agents for epoxy resins [NASA-CASE-ARC-11424-1] N85-21361

METAL CRYSTALS
Summary of recent research on mechanical behavior of polycrystalline solids [DE85-004601] N85-22199

METAL IONS
Negative lithium emission from a tungsten surface in a plasma [DE85-003456] N85-22167

METAL OXIDE SEMICONDUCTORS
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability [AD-A150004] N85-21515

METAL OXIDES
Thermal barrier coating system [NASA-CASE-LEW-13324-2] N85-21266
Characterization of high temperature electrically conducting oxides [DE85-004296] N85-21307

METAL POWDER
Preparation and study of highly reactive metal powders [AD-A150026] N85-21331
Slip casting and nitridation of silicon powder [NASA-TM-77809] N85-21406

METAL SHEETS
High strength steel sheet with dual phase structure [BMFT-FB-T-84-219] N85-21342

METAL SPINNING
Microstructural and electronic characteristics of metallic spin glasses [AD-A149959] N85-21371

METAL STRIPS
High strength steel sheet with dual phase structure [BMFT-FB-T-84-219] N85-21342

METAL SURFACES
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces [NASA-CR-175585] N85-21250
Adsorption thermodynamics and surface transport of metal catalyst poisons [DE85-003750] N85-21301
Ion-beam nitriding of steels [NASA-CASE-LEW-14104-1] N85-21324
Effects of B, Ti and Ta implantation on the wear resistance of Fe and Ni-plated Fe [AD-A149947] N85-21330
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement [DE85-001815] N85-21334
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks [PB85-108843] N85-21412

METALLIC GLASSES
Microstructural and electronic characteristics of metallic spin glasses [AD-A149959] N85-21371

METALLIZING
A process to produce fine line metallic collection patterns on semiconductors devices [NASA-CASE-NPO-16413-1] N85-21325

METALS
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation [AD-A150075] N85-21293
Properties of supported metal catalysts [DE85-003927] N85-21303
Method and apparatus for detecting acoustic emissions from metal matrix wire [AD-D011556] N85-22107
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra [DE85-003259] N85-22114
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235

METASTABLE STATE
Alloy development, processing and characterization of devitrified titanium base microcrystalline alloys [AD-A149609] N85-21327

METEORITES
Antarctic Meteorite Newsletter, volume 8, number 1 [NASA-CR-175587] N85-22328

METEORITIC MICROSTRUCTURES
Antarctic Meteorite Newsletter, volume 8, number 1 [NASA-CR-175587] N85-22328

METEOROID HAZARDS
Manmade orbital debris studies at NASA Langley N85-21192

METEOROID PROTECTION
Manmade orbital debris studies at NASA Langley N85-21192
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
Space debris protection for a reusable orbital transfer vehicle N85-21208
Parametric analysis: SOC meteoroid and debris protection N85-21209

METEOROIDS
Survivable propagation [AD-A150070] N85-21478
Improvement of VHF(MB) model [AD-A150087] N85-21480

METEOROLOGICAL CHARTS
Investigations of micro-turbulence in the bottom of the boundary layer [AD-A149823] N85-21897

METEOROLOGICAL PARAMETERS
Sector analysis of relevant meteorological parameters for long range transport of air pollutants [NR-27] N85-21882
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications [AD-A150097] N85-21900

METEOROLOGICAL RADAR
Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations — meteorological radar [DFVLR-FB-84-42] N85-21485

METEOROLOGICAL SATELLITES
Meteorological Satellite Center Technical Note No. 10, 1984 [MSC-TN-10] N85-21884
An analysis of the data obtained by a simultaneous observation of GMS and GMS-2: A study of the difference between the brightness temperatures by GMS and those by GMS-2 N85-21888
GMS operational calibration procedure and status N85-21893

METEOROLOGICAL SERVICES
AFOS (Automation of Field Operations and Services)-ERA forecast verification, September 1984 [PB85-137578] N85-21912

METEOROLOGY
Space Shuttle interactive meteorological data system study [NASA-CR-171418] N85-21876
On the relative motion of typhoons: In the case of Typhoon 8305 and Typhoons 8306 and 8307 N85-21885
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
SAOSUM: A short summary of observations [PB85-120384] N85-21909
Earth radiation budget experiment software development [NASA-CR-172567] N85-22002

METHANE
Kinetics of nitric oxide formation in laminar and turbulent methane combustion [PB85-149698] N85-21313
Mechanisms of heat and mass transfer across a double-diffusive interface [PB85-148468] N85-21584
Portable remote laser sensor for methane leak detection [NASA-CASE-NPO-15790-1] N85-21631

METHIONINE
Blood amino acids of cosmonauts before and after 211-day spaceflight N85-21933

METHOD OF CHARACTERISTICS
The split-coefficient matrix method for supersonic three dimensional flow N85-21425

METHYL COMPOUNDS
Process for producing tris(n-methylamino) methylsilane [NASA-CASE-MFS-25721-1] N85-21280

METROLOGY
Metrology for Electronic Technology: A bibliography of NBS (National Bureau of Standards) [PB85-112895] N85-21486

MICROBALLOONS
Development of the sonic pump levitator [NASA-CR-171362] N85-21186

MICROBIOLOGY
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984 [JPRS-USB-85-002] N85-21931
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
Dynamics of quantitative and qualitative changes in conditionally pathogenic microflora of the human intestine during long-term hypokinesia N85-21953

MICROCHANNEL PLATES
Development of high resolution imaging detectors for X-ray astronomy [NASA-CR-175505] N85-22266

MICROCOMPUTERS
A functional vehicle for autonomous mobile robot research [AD-A150052] N85-21666
Selection and use of general-purpose programming-language: Program examples, volume 2 [PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1 [PB85-122018] N85-22040
Microcomputers in transit: A software handbook [PB85-136414] N85-22042

MICROELECTRONICS
USSR report: Electronics and electrical engineering [JPRS-UEE-85-004] N85-21531
Transistor-transistor logic microcircuit tester N85-21556
Redundancy of codes for detection and correction of unidirectional errors N85-21557
New high resolution scanning ion microprobe and focused ion beam applications [AD-A149992] N85-21616
Investigation of device and electronic interactions in GaAs device processing [AD-A149747] N85-22182

MICROGRAVITY APPLICATIONS
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187

MICROHARDNESS
Ion-beam nitriding of steels [NASA-CASE-LEW-14104-1] N85-21324

MICROMETEOROIDS
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Survey of probable micrometer-sized Earth-orbital debris fragments in the NASA-JSC cosmic dust sample collection N85-21203
Impacts on Explorer 46 from an Earth orbiting population N85-21204
In-situ detection of micron-sized dust particles in near-Earth space N85-21205

MICROORGANISMS
Dynamics of quantitative and qualitative changes in conditionally pathogenic microflora of the human intestine during long-term hypokinesia N85-21953

MICROPARTICLES
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187

MICROPHONES
Carbon granule probe microphone for leak detection — recovery boilers [NASA-CASE-NPO-16027-1] N85-21597

MICROPROCESSORS
Synthesis of digital control for object with lag N85-21562
Remote self-contained undersea monitor [AD-D011520] N85-21599
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water [DE85-002781] N85-21619
Microprocessor-controlled rotating shadowband radiometer [DE85-003633] N85-21630
Second generation USAFSAM (United States Air Force School of Aerospace Medicine) microprocessor audiometer [AD-A149938] N85-21963
Automatic multi-banking of memory for microprocessors [NASA-CASE-NPO-15295-1] N85-21992
Variable data base generator apparatus [AD-D011515] N85-21993

MICROSTRIP TRANSMISSION LINES
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates [FOA-C-30383-E] N85-21527

MICROSTRUCTURE
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel [AERE-R-11034] N85-21315

Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties
[NASA-CR-174841] N85-21320
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
Microstructural and electronic characteristics of metallic spin glasses
[AD-A149959] N85-21371

MICROWAVE AMPLIFIERS
Combined microwave parallel amplifier-RF attenuator/modulator
[AD-D011535] N85-21490

MICROWAVE CIRCUITS
Monolithic thin film SAW (Surface Acoustic Wave) structures
[AD-A149782] N85-21511

MICROWAVE FREQUENCIES
Study of laminated dielectric behavior at microwave and millimeter-wave frequencies
[AD-P004358] N85-21452
Process for making a heterojunction source-drain insulated gate field-effect transistors utilizing diffusion to form the lattice
[AD-D011536] N85-22176

MICROWAVE OSCILLATORS
The 60 GHz gyrotron development program
[DE85-000599] N85-21522

MICROWAVE RADIOMETERS
The 13.9 GHz radiometer design
[AD-A149637] N85-21613

MICROWAVE SCATTERING
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483

MICROWAVE SENSORS
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
Evaluation of OMV ranging and docking systems N85-22230

MICROWAVES
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528
Analysis and computations of microwave-atmospheric interactions
[AD-A149686] N85-21854
Technical support for microwave experiments on the eye lens
[AD-A149702] N85-22144

MIDDLE ATMOSPHERE
An improved rocket-borne electric field meter for the middle atmosphere
[NASA-CR-175510] N85-21851

MIE SCATTERING
Novel photo-thermal technique for flow and spectroscopic measurements in a dense aerosol stream
[AD-A149745] N85-21287

MIGRATION
Plasticizer system for propellant compositions
[AD-D011514] N85-21393

MILITARY OPERATIONS
Dual band radome wall design
[AD-P004357] N85-21451
Base communications issues for the 1960s
[AD-A149764] N85-21474
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971

MILLIMETER WAVES
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304
Study of laminated dielectric behavior at microwave and millimeter-wave frequencies
[AD-P004358] N85-21452
A millimeter wave apparatus for free-space measurement of dielectric constants at high temperature
[AD-P004361] N85-21455
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481

MILLING (MACHINING)
Parametric evaluation of ball milling of SiC in water
[NASA-TM-86974] N85-21356

MINERAL DEPOSITS
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications --- Drum Mountains, Utah and Tonopath, Nevada
[E85-10095] N85-21757

MINERALOGY
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138

MINIATURIZATION
Development of miniature laser Doppler anemometers
[KU-SFB-210/ET/3] N85-21648

MINIMAX TECHNIQUE
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21680

MIRAGE AIRCRAFT
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110

MIRAGE 3 AIRCRAFT
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152

MIRRORS
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742

MISALIGNMENT
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries
[DE85-004598] N85-22201

MISSILE COMPONENTS
Dual band radome wall design
[AD-P004357] N85-21451
Hot radome boresight error measurements
[AD-P004364] N85-21458

MISSION PLANNING
A mathematical formulation of the problem of optimal use of ground resources for future space missions N85-22232

MIST
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122

MIXERS
Flameholder with integrated air mixer
[AD-D011549] N85-21161

MIXING
Convergence rates in the strong law for bounded mixing sequences
[CWI-MS-R8412] N85-22076

MIXING CIRCUITS
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437

MIXTURES
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
Process for producing tris s(n-methylamino) methylsilane
[NASA-CASE-MFS-25721-1] N85-21280

MOBILE COMMUNICATION SYSTEMS
Spread spectrum mobile radio communications
[AD-A149936] N85-21477

MODELS
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly
[DE85-003260] N85-21592
Evaluation of complex terrain air quality simulation models
[PB85-119485] N85-21835

MODULATION
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504

MODULATION TRANSFER FUNCTION
Infrared material optical damage by rain
[AD-P004372] N85-21466
MTF analysis of LANDSAT-4 Thematic Mapper N85-21737

MODULATORS
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437

MODULES
Application of large eddy interaction model to channel flow
[NASA-TM-86891] N85-21572

MODULUS OF ELASTICITY
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238

MOISTURE CONTENT
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
Human lung fluid content during 7-day head-down tilt N85-21941

MOLECULAR ABSORPTION
Carbon monoxide adsorption on a platinum electrode studied by polarization modulated FT-IRRAS (Fourier Transform-IR Reflections Adsorption Spectroscopy). Part 1: CO adsorbed in the double layer potential region and its oxidation in acids
[AD-A149751] N85-21288

MOLECULAR BEAM EPITAXY
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181

MOLECULAR CLOUDS
Mechanical energy release by protostars to molecular clouds N85-22302

MOLECULAR INTERACTIONS
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312
Bibliography of atomic and molecular processes, 1983
[DE85-000662] N85-22121
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126

MOLECULAR IONS
State-selected ion-molecule reaction dynamics
[AD-A150068] N85-22115
Multiparticle 3D imaging technique to study the structure of molecular ions
[DE85-001843] N85-22122

MOLECULAR ROTATION
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292

MOLECULAR SPECTRA
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250

MOLECULAR STRUCTURE
Multiparticle 3D imaging technique to study the structure of molecular ions
[DE85-001843] N85-22122

MOLECULAR WEIGHT
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372

MOLECULES
Electrostatic potentials: A new method for interpreting and predicting molecular reactivities and for designing synthetic pathways. Applications to nitroaromatics, nitramines and nitrated
[AD-A150120] N85-21298
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332

MOLTEN SALTS
Electrochemistry and electrochemical methodology in molten salts
[AD-A149613] N85-21284

MOLYBDENUM ALLOYS
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346

MOMENTS
A moment solution for an arbitrary configuration of partly shielded wires above a ground plane
[AD-A149762] N85-21473

MONITORS
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor
[DE85-003663] N85-21337
Remote self-contained undersea monitor
[AD-D011520] N85-21599
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
Focal plane array optical proximity sensor
[NASA-CASE-NPO-15155-1] N85-22139

MONOMERS
Process for preparing highly optically transparent-colorless armomatic polyimide film
[NASA-CASE-LAR-13351-1] N85-21360

MONOPULSE RADAR
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467

MONTE CARLO METHOD
A model for the evolution of on-orbit manmade debris environment N85-21196

Ordinary and proper location M-estimates for ARMA models, revised
[AD-A149705] N85-22061
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119

MOORING
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149696] N85-21968

MORPHOLOGY
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955
On the morphology of spiral modes --- disk galaxies N85-22283

MORTALITY
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817

MOSSBAUER EFFECT
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627

MOTION
Television animation store: Digital chroma, key and mixer units
[BBC-RD-1984/16] N85-21442

MOTION STABILITY
Translating rudder pedal system
[AD-D011510] N85-21172

MOVING TARGET INDICATORS
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar
[AD-D011561] N85-21436

MULTIBEAM ANTENNAS
3-D Dome/Rotman lens antenna breadboard demonstration
[AD-A149609] N85-21475

MULTIMISSION MODULAR SPACECRAFT
Multimission advanced configurations study --- telecommunication satellites
[MATRA-DM.51/CC/FL/0151.83] N85-21237

MULTIPROCESSING (COMPUTERS)
RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21998

MULTISPECTRAL BAND SCANNERS
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors --- New Mexico N85-21733
LANDSAT-4 Thematic Mapper calibration and atmospheric correction N85-21734
Thematic Mapper spectral dimensionality and data structure N85-21736
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper --- Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
The use of linear feature detection to investigate Thematic Mapper data performance and processing N85-21740
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746

MULTIVARIATE STATISTICAL ANALYSIS
On the limiting empirical distribution function of the eigenvalues of a multivariate F matrix
[AD-A149818] N85-22065
An asymptotically optimal subclass of BTIB designs for comparisons with a control
[AD-A149819] N85-22066

MUSCLES
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967

MUSCULAR STRENGTH
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936

MUSCULAR TONUS
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936

MUTATIONS
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928

MYOCARDIUM
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Preventive effect of acute heat factors during hypokinesia N85-21945

N

N-TYPE SEMICONDUCTORS
Multiple double heterojunction buried laser device
[AD-D011519] N85-21635

NASA PROGRAMS
Aerospace Safety Advisory Panel
[NASA-TM-87428] N85-21135
NASA/MSFC ground experiment for large space structure control verification
[NASA-TM-86496] N85-21248
Bibliography of Lewis Research Center technical publications announced in 1983
[NASA-TM-83693] N85-22255
Summary of activities of the Committee on Science and Technology
[H-REPT-98-1189] N85-22341

NATURAL GAS
Combustion gas properties. 2: Natural gas fuel and dry air
[NASA-TP-2435] N85-21168

NATURAL LANGUAGE (COMPUTERS)
The four forms of omega
[AD-A149694] N85-22020

NAVIER-STOKES EQUATION
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3884] N85-21272
Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149851] N85-21582
Hydrodynamic stability problem formulated by numerical solutions of the Navier-Stokes equations N85-22223

NAVIGATION
Dynamic world modeling for an intelligent mobile robot using a rotating ultra-sonic ranging device
[AD-A149979] N85-21143

NAVIGATION AIDS
Navigation for an intelligent mobile robot
[AD-A150051] N85-21144

NAVIGATION INSTRUMENTS
Evaluation of air and ground launched cruise missile navigational element containers
[AD-A149654] N85-21138

NAVSTAR SATELLITES
Optimization of guidance and control using function minimization and NAVSTAR/GPS
[AD-A149956] N85-21141
Program INNAVSAT: Global Positioning System (GPS): Test and demonstration program
[BMFT-FB-W-84-047] N85-21145

NAVY
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications
[AD-A150097] N85-21900
A review of neck injury and impaired consciousness associated with US Navy ejections 1 January 1969 - 31 December 1979 N85-21973
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143

NECK (ANATOMY)
The clinical and radiological assessment of cervical injury, Annex A N85-21976

NEEL TEMPERATURE
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197

NEGATIVE IONS
Reconsideration of sheath related to negative ion extraction
[IPPJ-706] N85-22159
Negative lithium emission from a tungsten surface in a plasma
[DE85-003456] N85-22167

NEPHANALYSIS
A new NASA/MSFC mission analysis global cloud cover data base
[NASA-TP-2448] N85-21878

NEUROMUSCULAR TRANSMISSION
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rhesous monkeys N85-21946
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967

NEUTRAL BEAMS
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170

NEUTRAL PARTICLES
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125

NEUTRON BEAMS
Paramagnetic scattering from Ni
[DE85-004207] N85-22198

NEUTRON EMISSION
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278

NEUTRON IRRADIATION
Effects of neutron irradiation on the fracture properties of HT-9 weld
[DE85-001068] N85-21339

NEUTRON SCATTERING
Neutron scattering studies of graphite intercalation compounds
[DE85-003079] N85-22196

NEUTRONS
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008

NEVADA
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138

NEW MEXICO
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors --- New Mexico N85-21733

NEWTON-RAPHSON METHOD
A solution method for large deformation contact problems
[AD-A149842] N85-21707
Direct secant updates of sparse matrix factors
[DE85-004008] N85-22073

NICKEL
Low temperature deposition of nickel films
[AD-D011568] N85-21319
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359
Paramagnetic scattering from Ni
[DE85-004207] N85-22198

NICKEL ALLOYS
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149605] N85-21328
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624

NICKEL CADMIUM BATTERIES
Nickel-cadmium battery cell reversal from resistive network effects
[AD-A149626] N85-21505

NICKEL COMPOUNDS
Alloys based on NiAl for high temperature applications
[NASA-TM-86976] N85-21322

NICKEL ZINC BATTERIES
Supported liquid membrane battery separators
[DE85-001031] N85-21519

NIMBUS 5 SATELLITE
Analysis of selective chopper radiometer data
[NASA-CR-175157] N85-21884

NIMBUS 7 SATELLITE
Atlas of reflectance patterns for uniform earth and cloud surfaces (NIMBUS-7ERB-61 days)
[PB85-116382] N85-21870
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980
[NASA-CR-175544] N85-22334

NIOBIUM
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel
[AERE-R-11034] N85-21315

NIOBIUM ALLOYS
Effect of reduction of strategic Columbium addition in 718 Alloy on the structure and properties
[NASA-CR-174841] N85-21320
NIOBIUM STANNIDES
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process
[DE85-003212] N85-22191
NITRATES
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
NITRIC ACID
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
NITRIC OXIDE
Kinetics of nitric oxide formation in laminar and turbulent methane combustion
[PB85-149698] N85-21313
NITRIDING
Ion-beam nitriding of steels
[NASA-CASE-LEW-14104-1] N85-21324
Slip casting and nitridation of silicon powder
[NASA-TM-77809] N85-21406
NITROBENZENES
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
NITROGEN COMPOUNDS
Electrostatic potentials: A new method for interpreting and predicting molecular reactivities and for designing synthetic pathways. Applications to nitroaromatics, nitramines and nitrated
[AD-A150120] N85-21298
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823
NITROGEN METABOLISM
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948
NITROGEN PLASMA
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644
NITROGEN TETROXIDE
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399
NITROUS OXIDES
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902
NOAA SATELLITES
The development of image processing of NOAA AVHRR data and its application to sea surface temperature N85-21891
NOISE (SOUND)
Further comparison of wind tunnel and airplane acoustic data for advanced design high speed propeller models
[NASA-TM-86935] N85-22108
NOISE PROPAGATION
Noise transmission loss of a rectangular plate in an infinite baffle
[NASA-TP-2398] N85-22109
NOISE TEMPERATURE
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements
[PB85-126148] N85-22265
NONDESTRUCTIVE TESTS
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
The role of dislocations in ultrasonic attenuation
[AERE-R-11384] N85-21317
Nondestructive testing of stainless steel to improve quality and output efficiency of the processing of ingot and continuous casting
[BMFT-FB-T-84-240] N85-21345
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes
[AD-D011554] N85-21603
A new NDE (Non-Destructive Evaluation) capability for thin-shelled structures
[AD-A149625] N85-21678
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
NONFERROUS METALS
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
NONLINEAR EQUATIONS
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
A method of calculating periodic solutions of second order dynamical systems
[AD-A149634] N85-22058
Nonlinear partial differential equations and related problems of Pade approximations
[AD-A149650] N85-22059
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071
Direct secant updates of sparse matrix factors
[DE85-004008] N85-22073
NONLINEAR EVOLUTION EQUATIONS
Nonlinear evolution of astrophysical Alfven waves N85-22294
NONLINEAR FILTERS
Synthesis of optimum receiver and processor for signal packet of radio pulses N85-21541
NONLINEAR SYSTEMS
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
NONLINEARITY
Nonlinear analysis for high-temperature multilayered fiber composite structures — turbine blades
[NASA-TM-83754] N85-21273
Control of nonlinear objects N85-21561
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution
[NASA-TM-86913] N85-21690
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719
Mesh effects on the computation of non-linear gravity waves of arbitrary discharge
[COLL-AERON-8501] N85-21848
NORTH AMERICA
Monthly and seasonal weather outlook for January 1985, volume 39, number 1
[PB85-148799] N85-21915
NORTHERN HEMISPHERE
A new NASA/MSFC mission analysis global cloud cover data base
[NASA-TP-2448] N85-21878
NOSE
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
NOSES (FOREBODIES)
Automated radome testing
[AD-P004362] N85-21456
Development of the F-20 nose radome
[AD-P004374] N85-21468
Nose and inlet duct radomes for the firebolt aerial target
[AD-P004375] N85-21469
NOZZLE DESIGN
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175
NOZZLE FLOW
An experimental study of spray thruster
[REPT-613] N85-21578
NOZZLE GEOMETRY
Preliminary analysis of tone-excited two-stream jet velocity decay
[NASA-TM-86951] N85-21114
NUCLEAR ELECTRIC POWER GENERATION
Technology transfer to the Middle East
[PB85-127744] N85-22264
NUCLEAR FUEL REPROCESSING
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly
[DE85-003260] N85-21592
NUCLEAR FUELS
Irradiation effects on fuels for space reactors
[DE84-016460] N85-22134
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
NUCLEAR FUSION
Plasma and nuclear processes in solar matter N85-22277
Opacity determinations for Inertial Confinement Fusion (ICF) materials using an average atom model N85-22295
NUCLEAR INTERACTIONS
Workshop on Nuclear Dynamics 3
[INC-40007-24] N85-22130
NUCLEAR MAGNETIC RESONANCE
Proton NMR and susceptibility measurements in TiCoH/sub x
[DE85-003309] N85-21336
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
NUCLEAR PHYSICS
Theoretical nuclear physics
[DE85-003466] N85-22135
Research in theoretical nuclear physics
[DE85-004349] N85-22137
NUCLEAR REACTORS
Proceedings of the 1984 DOE Nuclear Reactor and Facility Safety Conference, volume 1
[DE84-012130] N85-22132
Proceedings of the DOE Nuclear Reactor and Facility Safety Conference, volume 2
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NUCLEATION
A computer simulation of thin film nucleation and growth: The Volmer-Weber case
[NASA-TM-86968] N85-21264
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NUMERICAL ANALYSIS
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528
Interaction of part-through cracks in a flat plate
[NASA-CR-175588] N85-21602
Intensification of tropical instabilities
[AD-A149985] N85-21899
Cumulative reports and publications through December 31, 1984
[NASA-CR-172569] N85-21991
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
A proposal for standard basic functions in Ada
[CWI-NM-R8407] N85-22036
A method of calculating periodic solutions of second order dynamical systems
[AD-A149634] N85-22058
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069
Approximation order from certain spaces of smooth bivariate splines on a 3-direction mesh
[AD-A149633] N85-22092
Hydrodynamic stability problem formulated by numerical solutions of the Navier-Stokes equations N85-22223
NUMERICAL CONTROL
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
Synthesis of digital control for object with lag N85-21562
SIMULA: Digital controller simulation package
[PB85-134492] N85-22041
Sensor control of robot arc welding N85-22233
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248

NUMERICAL INTEGRATION
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
[NASA-TM-83590] N85-21162
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071
NUMERICAL WEATHER FORECASTING
Velocity inversion using a stratified reference
[AD-A150082] N85-21858
NUTATION
Attitude data consistence check of rocket payloads
[BMFT-FB-W-84-049] N85-21239
NYLON (TRADEMARK)
Piezoelectric transducer using electrically poled gamma-phase Nylon 11
[AD-D011552] N85-21602

O

O RING SEALS
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines
[NASA-TM-86928] N85-21569
OCEAN BOTTOM
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
OCEAN CURRENTS
Intensification of tropical instabilities
[AD-A149985] N85-21899
Circulation and internal waves in a cold Gulf Stream wave
[AD-A149704] N85-21918
Preliminary results of the oceanographic cruise of USCGC NORTHWIND to the Greenland Sea
[AD-A149802] N85-21919
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926
OCEAN DATA ACQUISITIONS SYSTEMS
Remote self-contained undersea monitor
[AD-D011520] N85-21599
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723
OCEAN MODELS
Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116178] N85-21831
Intensification of tropical instabilities
[AD-A149985] N85-21899
OCEAN SURFACE
Oceanographic and meteorological research based on the data products of SEASAT
[E85-10091] N85-21753
OCEAN TEMPERATURE
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765
Oceanic role in terrestrial climate
[DE85-004422] N85-21904
OCEAN THERMAL ENERGY CONVERSION
Experimental study of steam condensation on water in countercurrent flow in presence of inert gases
[DE84-013026] N85-21800
OCEANOGRAPHY
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922
Biological processes in the water column of the South Atlantic Bight. Volume 1: Published manuscripts
[DE85-004610] N85-21929
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143
OCEANS
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays
[PB85-129641] N85-21767
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916
ON-LINE SYSTEMS
Base communications issues for the 1960s
[AD-A149764] N85-21474
OPACITY
Opacity determinations for Inertial Confinement Fusion (ICF) materials using an average atom model
N85-22295
OPERATING TEMPERATURE
Electromagnetic Acoustic Transducers (EMATs) for erosion monitoring
[DE85-004834] N85-21628
OPERATIONS RESEARCH
Control of nonlinear objects N85-21561
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069
OPERATOR PERFORMANCE
The effect of jamming/deception on decision making
[AD-A149740] N85-21472
OPERATORS (MATHEMATICS)
Invariant differential operators on a semisimple symmetric space and finite multiplicities in a Plancherel formula
[CWI-PM-R8409] N85-22094
OPERATORS (PERSONNEL)
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248
OPTICAL COMMUNICATION
Optical fiber communications link design in compliance with systems performance standards
[PB85-111037] N85-21489
The future of lightwave technology
[PB85-109759] N85-22155
OPTICAL DATA PROCESSING
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145
Switchable zero order diffraction gratings as light valves
[AD-A150129] N85-22153
OPTICAL EQUIPMENT
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996
High resolution diffraction grating
[AD-D011541] N85-22141
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145
OPTICAL FILTERS
Imaging apparatus for transverse electrode electro-optic tunable filter
[AD-D011524] N85-21497
OPTICAL MEASUREMENT
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
OPTICAL MEASURING INSTRUMENTS
Operating time meter for tape recorder N85-21537
Design of an optical proximity sensor using multiple cones of light for measuring surface shape — application to a robot manipulator
[AD-A150050] N85-22152
OPTICAL POLARIZATION
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
OPTICAL PROPERTIES
Novel photo-thermal technique for flow and spectroscopic measurements in a dense aerosol stream
[AD-A149745] N85-21287
Control of electronic, magnetic and optical properties of doped polyacetylene conductors
[AD-A150117] N85-21375
Investigation of the optical properties of solar elements N85-21786
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape
[AD-A149961] N85-22147
OPTICAL PUMPING
Optically pumped iodine monofluoride laser
[AD-D011555] N85-21637
OPTICAL RADAR
In situ orbital debris experiment concepts N85-21198
On the inversion of the lidar equation
[AD-A149653] N85-21641
Observational study of transport in the free troposphere
[PB85-144145] N85-21845
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873
OPTICAL REFLECTION
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21638
OPTICAL TRACKING
NORAD operational system N85-21189
History of satellite break-ups in space N85-21190
OPTICAL TRANSFER FUNCTION
Infrared material optical damage by rain
[AD-P004372] N85-21466
OPTICAL WAVEGUIDES
Properties of chirped grating lenses in optical waveguides
[AD-A150023] N85-22149
OPTIMAL CONTROL
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176
An asymptotically optimal subclass of BTIB designs for comparisons with a control
[AD-A149819] N85-22066
OPTIMIZATION
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21680
Towards the generation of efficient code from verified programs
[TR-40] N85-22017
Rates of convergence of semistochastic approximation procedures for solving stochastic optimization problems N85-22068
A mathematical formulation of the problem of optimal use of ground resources for future space missions N85-22232
ORBIT DECAY
Orbital Debris
[NASA-CP-2360] N85-21188
History of satellite break-ups in space N85-21190
Manmade orbital debris studies at NASA Langley N85-21192
NASA/JSC orbital debris study: Debris model N85-21193
Proposed preliminary design criteria model environment for the 1990's N85-21194
The long term behaviour of Earth orbits and the implications for debris control N85-21213
ORBIT SPECTRUM UTILIZATION
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Engineering calculations for communications satellite systems planning
[NASA-CR-175552] N85-21233
ORBIT TRANSFER VEHICLES
Orbital Debris
[NASA-CP-2360] N85-21188
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Design study of an integrated aerobraking orbital transfer vehicle
[NASA-TM-58264] N85-21282
ORBITAL ELEMENTS
History of satellite break-ups in space N85-21190
ORBITAL LIFETIME
The long term behaviour of Earth orbits and the implications for debris control N85-21213
ORBITAL MANEUVERING VEHICLES
Evaluation of OMV ranging and docking systems N85-22230
ORBITAL MECHANICS
Orbital Debris
[NASA-CP-2360] N85-21188
History of satellite break-ups in space N85-21190
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
NASA/JSC orbital debris study: Debris model N85-21193
The long term behaviour of Earth orbits and the implications for debris control N85-21213
Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
ORBITAL POSITION ESTIMATION
Air Force satellite position management N85-21217
ORBITAL SERVICING
Orbital Debris
[NASA-CP-2360] N85-21188
Satellite services and orbital retrieval N85-21211
ORBITAL SPACE STATIONS
Parametric analysis: SOC meteoroid and debris protection N85-21209
Natural environment design criteria for the Space Station definition and preliminary design
[NASA-TM-86498] N85-21232
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
Debris impact on Earth-orbiting spacecraft N85-22234
The intelligent database machine N85-22242
ORBITALS
Vacancy-rearrangement theory in the first Magnus approximation
[DE85-004435] N85-22123

ORGANIC CHEMISTRY
A study of organic chemical reactions in microemulsions
[AD-A150083] N85-21265
ORGANIC COMPOUNDS
A study of organic chemical reactions in microemulsions
[AD-A150083] N85-21265
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Standard analytical procedures of the NOAA National Analytical Facility, 1984-85: Extractable toxic organic compounds
[PB85-126282] N85-21840
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149698] N85-21988
ORGANIC PHOSPHORUS COMPOUNDS
Isolation, concentration and subsequent analysis by capillary gas chromatography of trace amounts of organophosphorus compounds from aqueous samples
[AD-B089301L] N85-21308
Fire-resistant phosphorus containing compounds, polyimides and copolyimides
[NASA-CASE-ARC-11522-2] N85-21363
ORGANOMETALLIC COMPOUNDS
Preparation and study of highly reactive metal powders
[AD-A150026] N85-21331
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340
ORIENTATION
Determining object orientation from a single image using multiple information sources
[AD-A149980] N85-22146
ORTHOGONAL FUNCTIONS
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
ORTHOSTATIC TOLERANCE
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rheseus monkeys N85-21946
OSCILLATIONS
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study
[AD-A150059] N85-21645
OSCILLATORS
Oscillator development
[AD-A149699] N85-21509
OUTLET FLOW
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
OUTPUT
Adaptive regulation of transmitter radiation power in radio lines during delays of control signals N85-21551
OXIDATION
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27
[NASA-TP-2443] N85-21323
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358
The use of hydrazine as an alternate source of energy
[NASA-CR-175535] N85-21397
Oxidation and gum formation in jet fuels
[AD-A149934] N85-21401
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
OXIDATION RESISTANCE
Investigation of the development possibilities of a ferritic creep and oxidation-resistant steel for application under creep conditions above 650 deg C
[BMFT-FB-T-84-244] N85-21344
OXIDATION-REDUCTION REACTIONS
Preparation and study of highly reactive metal powders
[AD-A150026] N85-21331
OXIDES
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel
[AERE-R-11034] N85-21315
OXIDIZERS
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399
OXYGEN
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
OXYGEN IONS
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
OXYGENATION
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765
OZONE
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
Air quality criteria for ozone and other photochemical oxidants, external review draft, volume 3
[PB85-126050] N85-21837
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838
Simultaneous cabin and ambient ozone measurements on two Boeing 747 airplanes. Volume 3: October 1978 - July 1979
[NASA-TM-86883] N85-21872
Non-precipitating cumulus cloud study
[DE85-002352] N85-21902

P

P-N-P JUNCTIONS
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
P-TYPE SEMICONDUCTORS
Multiple double heterojunction buried laser device
[AD-D011519] N85-21635
P-3 AIRCRAFT
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143
PACIFIC OCEAN
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926
PACKAGING
Evaluation of air and ground launched cruise missile navigational element containers
[AD-A149654] N85-21138
PACKET SWITCHING
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001
PACKET TRANSMISSION
Multicomputer communication system
[NASA-CASE-NPO-15433-1] N85-21428
Spread spectrum mobile radio communications
[AD-A149936] N85-21477
PACKETS (COMMUNICATION)
Synthesis of optimum receiver and processor for signal packet of radio pulses N85-21541
PADE APPROXIMATION
Mesh effects on the computation of non-linear gravity waves of arbitrary discharge
[COLL-AERON-8501] N85-21848
Nonlinear partial differential equations and related problems of Pade approximations
[AD-A149650] N85-22059
PAINTS
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers
[ARL-MAT-R-117] N85-21326
PAIR PRODUCTION
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297
PANEL METHOD (FLUID DYNAMICS)
Calculation of the flow around thick wings with separation vortices N85-21424
PANELS
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
Temperature responses of composite panels
[AD-A150053] N85-21277
Power from the Sun: Light at night
[PB85-124097] N85-21814
PARABOLIC ANTENNAS
Image lobe analysis for large radomes
[AD-P004359] N85-21453
PARABOLIC DIFFERENTIAL EQUATIONS
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
Brownian motion with a parabolic drift and Airy functions
[CWI-MS-R8413] N85-22097
PARADOXES
The automated reasoning system ITP
[ANL-84-27] N85-22016
PARALLEL PROCESSING (COMPUTERS)
PISCES: An environment for parallel scientific computation
[NASA-CR-172544] N85-22004
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024
Very-high level concurrent programming
[AD-A150009] N85-22026
Characterizing the parallelism in rule-based expert systems
[DE85-002432] N85-22047
Parallel processing of encoded bit strings
[AD-A149812] N85-22064
PARALLEL PROGRAMMING
Parallel linear algebra library for the Denelcor HEP
[DE85-004685] N85-22034
PARAMAGNETISM
Paramagnetic scattering from Ni
[DE85-004207] N85-22198
PARAMETER IDENTIFICATION
Determination of physical parameters of jets in radio galaxies N85-22304
PARAMETERIZATION
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069
PARKING ORBITS
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
PARSING ALGORITHMS
An algorithm for generating abstract syntax trees
[NASA-CR-172541] N85-22003
PARTIAL DIFFERENTIAL EQUATIONS
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
PARTICLE ACCELERATION
Review of polarized proton beam techniques and a report on the workshop on polarized beams
[DE85-004390] N85-22127
Strong iron accelerating by collisionless magnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278
Self-similar modified shock structures — cosmic rays N85-22290
Explosive transverse electric field and particle acceleration during magnetic collapse — cosmic plasma N85-22292
Signatures of the coalescence instability in solar flares N85-22293
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
PARTICLE ACCELERATORS
Simulation of space charge effects in particle accelerators
[DE85-001828] N85-22120
PARTICLE BEAMS
Statistical phenomena in particle beams
[DE85-001050] N85-22118
Suppression of tilting instability of a compact torus by energetic particle beams
[IPPJ-705] N85-22157
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions
[DE85-000887] N85-22192

PARTICLE COLLISIONS
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126
PARTICLE DIFFUSION
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179
PARTICLE FLUX DENSITY
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252
Rocket observations of the ionosphere during the eclipse of 26 February 1979
[NASA-CR-175513] N85-21850
PARTICLE INTERACTIONS
Bibliography of atomic and molecular processes, 1983
[DE85-000662] N85-22121
PARTICLE MOTION
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
Particle transport in planetary magnetospheres N85-22275
PARTICLE SIZE DISTRIBUTION
Particle size, number, composition and velocity from solid rocket motors N85-21201
Environment definition, large particles N85-21220
Measurements N85-21222
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system
[NASA-CR-174839] N85-21604
PARTICLE TRACKS
Use of ground radar to detect reentering debris N85-21200
PARTICLES
Solid particle environment and protection for the Galileo Orbiter N85-21207
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique
[AD-D011548] N85-21281
Improved silicon grinding method and apparatus
[NASA-CASE-NPO-16336-1-CU] N85-21407
Solid particle receiver experiments: Velocity measurements
[DE85-000257] N85-21623
PASCAL (PROGRAMMING LANGUAGE)
The automated reasoning system ITP
[ANL-84-27] N85-22016
PATTERN RECOGNITION
Method of multivariant intraclass pattern recognition
[AD-D011546] N85-21405
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
A computer-based gaming system for assessing recognition performance (RECOG)
[AD-A149572] N85-22022
Technical support for creating an artificial intelligence system for feature extraction and experimental design
[NASA-CR-175286] N85-22044
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape
[AD-A149981] N85-22147
PATTERN REGISTRATION
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746
Technical support for creating an artificial intelligence system for feature extraction and experimental design
[NASA-CR-175286] N85-22044
PATTERNS
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape
[AD-A149981] N85-22147
PAVEMENTS
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108843] N85-21412
Stress-relieving interlayers for bituminous resurfacings
[PB85-136885] N85-21415
PAYLOAD CONTROL
Sounding rocket program Aeronomie. The payload M-I in the project MAP-WINE
[BMFT-FB-W-84-046] N85-21238
PAYLOAD DELIVERY (STS)
Satellite services and orbital retrieval N85-21211
PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM
Satellite services and orbital retrieval N85-21211
PAYLOAD RETRIEVAL (STS)
Satellite services and orbital retrieval N85-21211
A remotely controlled orbiting retriever N85-21212
PAYLOAD TRANSFER
Satellite services and orbital retrieval N85-21211
PAYLOADS
Rail accelerator technology and applications
[NASA-TM-86947] N85-21258
PEELING
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
PENTANES
Thermophysical properties of working fluids for binary geothermal cycles
[DE85-000385] N85-21804
PEPTIDES
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
PERCEPTION
Annals of the New York Academy of Sciences, Volume 423 — timing and time perception
[AD-A150031] N85-21981
PERFORATED PLATES
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-409] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-406] N85-21701
PERFORMANCE PREDICTION
Sample size and precision in communication performance measurements
[PB85-1143270] N85-21488
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats
[DE85-000529] N85-21805
PERFORMANCE TESTS
Tailored airfoils for vertical axis wind turbines
[DE85-004628] N85-21128
Landing control centrals
[AD-A149800] N85-21140
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
PERIGEES
The long term behaviour of Earth orbits and the implications for debris control N85-21213
PERMITTIVITY
Study of laminated dielectric behavior at microwave and millimeter-wave frequencies
[AD-P004358] N85-21452
A millimeter wave apparatus for free-space measurement of dielectric constants at high temperature
[AD-P004361] N85-21455
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559
PERSONAL COMPUTERS
ZTL: A subroutine package for the IBM personal computer to support the Zlatech ZT1488 IEEE-488 controller
[LA-10141-MS] N85-22010
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013
ZTLCK: A subroutine package for the IBM personal computer to support the Zlatech ZT1488 real time clock
[LA-10146-MS] N85-22014
TRANIO: A subroutine package for the IBM personal computer to support the transfer 6002 CAMAC crate controller
[LA-10145-MS] N85-22015
The performance of a type-insensitive Runge-Kutta code on a personal computer
[TUM-I8410] N85-22048
PERT
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069
PERTURBATION
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004568] N85-22171
A study of the compatibility of an existing CFD package with a broader class of material constitutions N85-22219
PERTURBATION THEORY
Velocity inversion using a stratified reference
[AD-A150082] N85-21858
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330
PETN
Nonprimary-explosive, hot-wire detonator
[DE85-005195] N85-21403
PETROLOGY
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138
Antarctic Meteorite Newsletter, volume 8, number 1
[NASA-CR-175587] N85-22326
PHARMACOLOGY
Review of US guide on medication and flying N85-21958
PHASE CHANGE MATERIALS
Evaluation of ettringite and related compounds for use in solar energy storage
[DE85-003249] N85-21809
PHASE CONTROL
Method and apparatus for self-calibration and phasing of array antenna
[NASA-CASE-NPO-15920-1] N85-21493
PHASE DETECTORS
Double reference pulsed phase locked loop (DRP-2L-2)
[NASA-CASE-LAR-13310-1] N85-21441
Wideband phase keyers N85-21544
PHASE DIAGRAMS
Research on microemulsions for storage and conversion of solar energy
[DE85-000181] N85-21807
PHASE LOCKED SYSTEMS
Double reference pulsed phase locked loop (DRP-2L-2)
[NASA-CASE-LAR-13310-1] N85-21441
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths
[NASA-TM-86379] N85-21874
New results on the PLL false lock phenomenon N85-22236
PHASE MODULATION
L.F. RADIO-DATA: Specification of BBC phase-modulated transmissions on long-wave
[BBC-RD-1984/19] N85-21431
PHASE SHIFT
Double reference pulsed phase locked loop (DRP-2L-2)
[NASA-CASE-LAR-13310-1] N85-21441
Combined microwave parallel amplifier-RF attenuator/modulator
[AD-D011535] N85-21490
Wideband phase keyers N85-21544
PHASE SHIFT CIRCUITS
Low sidelobe phased array antenna system
[AD-D011558] N85-21435
PHASE SHIFT KEYING
Wideband phase keyers N85-21544
Optimal discrete filtration of intricate phase-keyed signals N85-21550
PHASE TRANSFORMATIONS
Electric and magnetic properties of intercalated graphite
[AD-A149848] N85-21276
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299

Alloy development, processing and characterization of devitrified titanium base microcrystalline alloys
[AD-A149809] N85-21327
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448
Phase change thermal energy storage and the model building codes
[PB85-111201] N85-21813
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235

PHASED ARRAYS
Use of ground radar to detect reentering debris N85-21200
Low sidelobe phased array antenna system
[AD-D011558] N85-21435
Method and apparatus for self-calibration and phasing of array antenna
[NASA-CASE-NPO-15920-1] N85-21493
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
Phased antenna array for wind profiling applications
[PB85-132884] N85-21529

PHENOLIC RESINS
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213

PHENOLOGY
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
User's guide to the TAMW wheat model as implemented on the IBM 360/195 computer
[E85-10084] N85-21749
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
Estimating solar radiation for plant simulation models
[E85-10069] N85-21751

PHENYLS
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals
[NASA-TM-83800] N85-22204

PHOSPHIDES
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195

PHOSPHINES
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-2] N85-21347

PHOSPHORUS COMPOUNDS
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286

PHOSPHORUS POLYMERS
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-2] N85-21347

PHOTOACOUSTIC SPECTROSCOPY
Photoacoustic effect and its applications N85-21421

PHOTOCATHODES
Development and application of low energy X-ray and electron physics
[AD-A149663] N85-22099

PHOTOCHEMICAL OXIDANTS
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
Air quality criteria for ozone and other photochemical oxidants, external review draft, volume 3
[PB85-126050] N85-21837

PHOTOCHEMICAL REACTIONS
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor
[AD-A150111] N85-21295
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849

PHOTODIODES
Focal plane array optical proximity sensor
[NASA-CASE-NPO-15155-1] N85-22139

PHOTOELECTRIC EFFECT
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3674] N85-21675

PHOTOELECTRIC EMISSION
Operating time meter for tape recorder N85-21537
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183

PHOTOELECTROCHEMISTRY
Solar-assisted hydrogen generation by photoelectrocatalysis
[PB85-149706] N85-21314

PHOTOELECTRON SPECTROSCOPY
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
The Valence- and conduction-band structure of the sapphire(1102) surface
[AD-A150001] N85-22184

PHOTOGEOLOGY
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications --- Drum Mountains, Utah and Tonopath, Nevada
[E85-10095] N85-21757

PHOTOGRAMMETRY
Radar calibration using direct measurement equipment and oblique photometry
[AD-D011530] N85-21433
Hybrid method of mapping and photogeodetic control network densification
[PB85-133775] N85-21766

PHOTOGRAPHIC FILM
Development and application of low energy X-ray and electron physics
[AD-A149983] N85-22099

PHOTOGRAPHS
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982
[NASA-TM-86347] N85-21877

PHOTOIONIZATION
State-selected ion-molecule reaction dynamics
[AD-A150068] N85-22115

PHOTOLYSIS
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340

PHOTOMETRY
Planetary cartography in the next decade (1984 - 1994)
[NASA-SP-475] N85-22323

PHOTONS
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481

PHOTOVOLTAIC CELLS
GaAs and 3-5 compound solar cells status and prospects for use in space
[NASA-TM-86960] N85-21261
Power from the Sun: Light at night
[PB85-124097] N85-21814

PHOTOVOLTAIC CONVERSION
International Congress Centrum Berlin report on photovoltaics N85-21773
Crystallization methods for solar cell silicon N85-21774
Development and prototype construction of photovoltaic energy supply units N85-21781
Photovoltaic solar components N85-21782
Photovoltaic roofing tile systems N85-21783
Investigation of the optical properties of solar elements N85-21786
Development of high-efficiency economic systems for photovoltaics N85-21795

PHTHALOCYANIN
Phthalocyanine polymers
[NASA-CASE-ARC-11413-1] N85-21348
Metal (11) 4,4',4',4''-phthalocyanine tetraamines as curing agents for epoxy resins
[NASA-CASE-ARC-11424-1] N85-21361

PHYSICAL CHEMISTRY
Physical-chemical investigations of copper sulfides for use in CdS/Cu2S solar cells N85-21794

PHYSIOLOGICAL EFFECTS
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955
Effect of stationary magnetic field on bleeding time N85-21956
High pressure environmental conditioning systems and chamber rehabilitation
[AD-A150039] N85-21964

PHYSIOLOGICAL RESPONSES
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966

PHYSIOLOGICAL TESTS
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966

PHYSIOLOGY
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942

PIEZOELECTRIC CRYSTALS
Normal coordinate monolithic crystal filter
[AD-D011496] N85-22188
Stress compensation crystal device
[AD-D011497] N85-22189

PIEZOELECTRIC TRANSDUCERS
Piezoelectric transducer using electrically poled gamma-phase Nylon 11
[AD-D011552] N85-21602

PIEZOELECTRICITY
Switchable zero order diffraction gratings as light valves
[AD-A150129] N85-22153

PIEZORESISTIVE TRANSDUCERS
Technology of thin silicon foils for the fabrication of monolithic integrated sensors
[BMFT-FB-T-84-209] N85-22202

PILOT PLANTS
Development and prototype construction of photovoltaic energy supply units N85-21781

PIPELINES
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688

PIPES (TUBES)
Characterization and optimization of polyethylene resins and gas pipe
[PB85-118511] N85-21382
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
Steam generator tube vibration tests
[DE85-003599] N85-21712
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718

PISTON ENGINES
Gas-fired duplex free-piston Stirling refrigerator N85-21413

PISTONS
Pneumatic clamping device
[AD-D011544] N85-21656

PL/1
Selection and use of general-purpose programming-language: Program examples, volume 2
[PB85-122000] N85-22039
Selection and use of general-purpose programming language: Overview, volume 1
[PB85-122018] N85-22040

PLANE WAVES
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2
[AD-A150131] N85-22187

PLANETARY ATMOSPHERES
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327

PLANETARY GEOLOGY
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326

PLANETARY MAGNETIC FIELDS
Magnetospheres in the solar system N85-22274
Particle transport in planetary magnetospheres N85-22275
PLANETARY MAPPING
Planetary cartography in the next decade (1984 - 1994)
[NASA-SP-475] N85-22323
PLANETARY WAVES
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
PLANKTON
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926
Biological processes in the water column of the South Atlantic Bight. Volume 1: Published manuscripts
[DE85-004610] N85-21929
PLANTS (BOTANY)
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
Estimating solar radiation for plant simulation models
[E85-10089] N85-21751
PLASMA ARC WELDING
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224
PLASMA CONTROL
Plasma performance of TFCX and jet with sawtoothing
[DE85-003335] N85-22168
Opacity determinations for Inertial Confinement Fusion (ICF) materials using an average atom model N85-22295
PLASMA CURRENTS
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172
PLASMA DENSITY
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
Plasmachemical evaporation and doping of amorphous silicon N85-21790
Electrostatic confinement in a bumpy torus
[DE85-003794] N85-22164
Determination of experimental Tokamak plasma properties using maximum entropy analysis
[DE85-001723] N85-22165
PLASMA DIAGNOSTICS
Intensified CCD camera system for plasma diagnostics
[DE85-002252] N85-21620
Arc-driven rail gun research
[NASA-CR-174816] N85-21662
Determination of experimental Tokamak plasma properties using maximum entropy analysis
[DE85-001723] N85-22165
X-ray astronomy and plasma astrophysics N85-22288
PLASMA DIODES
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
PLASMA DRIFT
Electrostatic confinement in a bumpy torus
[DE85-003794] N85-22164
PLASMA DYNAMICS
Rail accelerator technology and applications
[NASA-TM-86947] N85-21258
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
PLASMA EQUILIBRIUM
The continuous spectrum of an axisymmetric, self-gravitating equilibrium in the presence of a poloidal magnetic field N85-22315
PLASMA GENERATORS
Characteristics of multiarc plasma devices N85-21554
PLASMA HEATING
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172
PLASMA INTERACTION EXPERIMENT
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252
PLASMA JETS
Characteristics of multiarc plasma devices N85-21554
Plasma performance of TFCX and jet with sawtoothing
[DE85-003335] N85-22168
Determination of physical parameters of jets in radio galaxies N85-22304
Hydrodynamics of astrophysical jets — active galactic nuclei N85-22307
Viscous jets — extragalactic jets N85-22308
Jets in galaxies N85-22309
PLASMA LAYERS
Development and application of low energy X-ray and electron physics
[AD-A149983] N85-22099
PLASMA PHYSICS
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004568] N85-22171
PLASMA PROPULSION
Ring-cusp ion thruster with shell anode
[NASA-CASE-LEW-13881-1] N85-21256
PLASMA RADIATION
Arguments for fundamental emission by the parametric process L yields T + S in interplanetary type III bursts — langmuir, electromagnetic, ion acoustic waves (L, T, S) N85-22311
PLASMA SHEATHS
Reconsideration of sheath related to negative ion extraction
[IPPJ-706] N85-22159
PLASMA TEMPERATURE
Heat flux in Lorentzian plasma
[IPPJ-704] N85-22158
PLASMA TURBULENCE
Cosmic ray generation by plasma turbulence: Development of a new paradigm in physics N85-22286
Arguments for fundamental emission by the parametric process L yields T + S in interplanetary type III bursts — langmuir, electromagnetic, ion acoustic waves (L, T, S) N85-22311
PLASMA WAVES
Dynamics of space charge waves in the laser beat wave accelerator
[AD-A149688] N85-22163
On the spectrum of longitudinal waves in the hot degenerate plasma N85-22280
Nonlinear waves in the magnetosphere of pulsars N85-22281
PLASMAS (PHYSICS)
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
Investigation of plasma processes in electronic transition lasers
[AD-A149682] N85-21506
The 60 GHz gyrotron development program
[DE85-000599] N85-21522
Analysis and computations of microwave-atmospheric interactions
[AD-A149666] N85-21854
Plasma mass and effective inductance in a small rainbow
[MRL-R-947] N85-22162
Negative lithium emission from a tungsten surface in a plasma
[DE85-003456] N85-22167
Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170
PLASMATRONS
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Reducing electric power losses in discharge chamber of induction plasmatron N85-21553
PLASMONS
Inelastic tunnel diodes
[NASA-CASE-LEW-13833-1] N85-21492
Solar energy converter using surface plasma waves
[NASA-CASE-LEW-13827-1] N85-21768
The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184
PLASTIC COATINGS
Process for preparing highly optically transparent-colorless armomatic polyimide film
[NASA-CASE-LAR-13351-1] N85-21360
PLASTIC DEFORMATION
Stress corrosion cracking behavior of tungsten heavy alloys
[AD-A149843] N85-21329
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
PLASTIC PROPERTIES
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples
[AERE-R-10549] N85-22173
PLASTICIZERS
Plasticizer system for propellant compositions
[AD-D011502] N85-21390
Plasticizer system for propellant compositions
[AD-D011508] N85-21391
Azido nitramino ether containing solid propellants
[AD-D011511] N85-21392
Plasticizer system for propellant compositions
[AD-D011514] N85-21393
Plasticizer system for propellant compositions
[AD-D011516] N85-21394
Plasticizer system for propellant compositions
[AD-D011517] N85-21395
PLASTICS
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828
PLATES (STRUCTURAL MEMBERS)
Geometrically nonlinear analysis of laminated elastic structures
[NASA-CR-175609] N85-21720
PLATINUM
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
Advanced thin film thermocouples
[NASA-CR-175541] N85-21607
PLATINUM ALLOYS
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260
PLOTTING
Implementation of the computer program-system MOSS (Map Overlay and Statistical System) on a VAX-11 series computer under VMS
[AD-A149612] N85-22019
PLUMES
Preliminary analysis of tone-excited two-stream jet velocity decay
[NASA-TM-86951] N85-21114
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
Time and space variability of turbulent concentration fluctuations
[AD-A149963] N85-21898
PLUTONIUM
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9680-SR] N85-22131
PNEUMATIC EQUIPMENT
Pneumatic clamping device
[AD-D011544] N85-21656
POINT SPREAD FUNCTIONS
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741
POINTING CONTROL SYSTEMS
Modal control of structural systems
[AD-A149734] N85-21235
POLAR CAPS
An atlas of polar cap energetic particle observations. Volume 2: NOAA-6, 8 July 1979 to 10 May 1983
[PB85-109072] N85-21868
POLAR ORBITS
S3-3 ONFI-116 data analysis
[AD-A149725] N85-21855
POLAR REGIONS
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
An atlas of polar cap energetic particle observations. Volume 2: NOAA-6, 8 July 1979 to 10 May 1983
[PB85-109072] N85-21868
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916
POLARIZATION (CHARGE SEPARATION)
Stress corrosion cracking behavior of tungsten heavy alloys
[AD-A149843] N85-21329
POLARIZATION (SPIN ALIGNMENT)
Review of polarized proton beam techniques and a report on the workshop on polarized beams
[DE85-004390] N85-22127
POLARIZATION (WAVES)
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448

POLARIZED RADIATION
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
The ultraviolet excess of quasars 3: The highly polarized quasars PKS 0736+017 and PKS 1510-089 [NASA-CR-175576] N85-22268
POLICIES
Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
Orbital debris policy issues: Battelle involvement and some personal observations N85-21218
Considerations for policy on man-made debris propagation control N85-21219
Spacecraft hazard and shielding requirements N85-21224
Systems research on China in year 2000 N85-21418
Oversight review of the five-year outlook report on science and technology [GPO-41-058] N85-22243
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy [GPO-41-060] N85-22244
POLLUTION CONTROL
Considerations for policy on man-made debris propagation control N85-21219
Role of biological assessment in effluent control [PB85-116101] N85-21830
POLLUTION MONITORING
Role of biological assessment in effluent control [PB85-116101] N85-21830
Evaluation of complex terrain air quality simulation models [PB85-119485] N85-21835
Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE) [PB85-128460] N85-21839
POLLUTION TRANSPORT
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1 [AD-A149597] N85-21399
ELECT groundwater transport research code [DE85-003284] N85-21824
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2 [PB85-126043] N85-21836
Hazardous air pollutants: Wet removal rates and mechanisms [PB85-138626] N85-21842
Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena [PB85-137370] N85-21844
Observational study of transport in the free troposphere [PB85-144145] N85-21845
Sector analysis of relevant meteorological parameters for long range transport of air pollutants [NR-27] N85-21882
POLOIDAL FLUX
The continuous spectrum of an axisymmetric, self-gravitating equilibrium in the presence of a poloidal magnetic field N85-22315
POLYACETYLENE
Control of electronic, magnetic and optical properties of doped polyacetylene conductors [AD-A150117] N85-21375
Polymeric electrolytes for ambient temperature lithium batteries [DE85-001032] N85-21518
POLYAMIDE RESINS
Process for preparing highly optically transparent-colorless aromatic polyimide film [NASA-CASE-LAR-13351-1] N85-21360
Fire and heat resistant laminating resins based on maleimido and citraconimido substituted 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diaminobenzenes [NASA-CASE-ARC-11533-1] N85-21364
POLYBUTADIENE
LL-100: A new polybutadiene (resin system for radome applications) [AD-P004368] N85-21462
POLYCRYSTALS
Summary of recent research on mechanical behavior of polycrystalline solids [DE85-004601] N85-22199
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves [AERE-R11483] N85-22203
POLYESTER RESINS
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products [AD-A149777] N85-21368
Scale-up of vanadium trineodecanoate [AD-A149835] N85-21370
POLYETHYLENES
Characterization and optimization of polyethylene resins and gas pipe [PB85-118511] N85-21362
POLYIMIDE RESINS
Phosphorus-containing imide resins [NASA-CASE-ARC-11368-2] N85-21347
Chemical approach for controlling nadimide cure temperature and rate with maleimide [NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide [NASA-CASE-LEW-13770-4] N85-21351
Chemical approach for controlling nadimide cure temperature and rate [NASA-CASE-LEW-13770-5] N85-21352
POLYIMIDES
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft [NASA-CASE-LAR-12775-2] N85-21349
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes [NASA-CASE-ARC-11512-2] N85-21362
Fire-resistant phosphorus containing compounds, polyimides and copolyimides [NASA-CASE-ARC-11522-2] N85-21363
POLYMERIC FILMS
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces [NASA-CR-175585] N85-21250
Process for preparing highly optically transparent-colorless aromatic polyimide film [NASA-CASE-LAR-13351-1] N85-21360
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films [DE84-013039] N85-21377
Polymeric electrolytes for ambient temperature lithium batteries [DE85-001032] N85-21518
POLYMERIZATION
A brief review of the technology of microemulsions and other micellar systems [AD-A149759] N85-21289
Phthalocyanine polymers [NASA-CASE-ARC-11413-1] N85-21348
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes [NASA-CASE-ARC-11512-2] N85-21362
Fire and heat resistant laminating resins based on maleimido and citraconimido substituted 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diaminobenzenes [NASA-CASE-ARC-11533-1] N85-21364
Rheology of dissemination [AD-A150006] N85-21373
Plasticizer system for propellant compositions [AD-D011516] N85-21394
Amine salts as bonding agents [AD-D011543] N85-21396
LL-100: A new polybutadiene (resin system for radome applications) [AD-P004368] N85-21462
POLYMERS
Low temperature deposition of nickel films [AD-D011568] N85-21319
Control of electronic, magnetic and optical properties of doped polyacetylene conductors [AD-A150117] N85-21375
Polymer intermediates from limonene (follow-up project) [BMFT-FB-T-84-243] N85-21380
POLYNOMIALS
A note on the use of polynomial transformations in evaluating singular integrals [MATHEMATICS-RESEARCH-165] N85-22053
POLYSTATION DOPPLER TRACKING SYSTEM
Fundamental limits to synchronization and tracking [AD-A149623] N85-21504
POLYSTYRENE
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187
POLYSULFIDES
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products [AD-A149777] N85-21368
POLYURETHANE FOAM
X-ray gauge measures areal density variations as small as 0.1% [DE85-003774] N85-21629
POLYURETHANE RESINS
Fluorinated polyurethanes [AD-D011526] N85-21353
POPULATION INVERSION
Optimization of silicon-nitride-inversion layer solar cells N85-21784
POROSITY
Slip casting and nitridation of silicon powder [NASA-TM-77809] N85-21406
PORTABLE EQUIPMENT
Portable remote laser sensor for methane leak detection [NASA-CASE-NPO-15790-1] N85-21631
POSITION ERRORS
Ordinary and proper location M-estimates for ARMA models, revised [AD-A149705] N85-22061
POSITIONING
Navigation for an intelligent mobile robot [AD-A150051] N85-21144
POSITRON ANNIHILATION
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples [AERE-R-10549] N85-22173
POSITRONS
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297
POTASSIUM
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report [DE85-003715] N85-22169
POTENTIAL ENERGY
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity [NASA-CR-174872] N85-21685
POTENTIAL FLOW
Numerical integration of the unsteady full-potential equation with applications to transonic flow about a two-dimensional airfoil [NLR-MP-84022-U] N85-21130
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm [NLR-MP-84003-U] N85-21593
POWDER METALLURGY
Alloys based on NiAl for high temperature applications [NASA-TM-86976] N85-21322
Stress corrosion cracking behavior of tungsten heavy alloys [AD-A149843] N85-21329
POWER AMPLIFIERS
Combined microwave parallel amplifier-RF attenuator/modulator [AD-D011535] N85-21499
POWER CONDITIONING
Inelastic tunnel diodes [NASA-CASE-LEW-13833-1] N85-21492
POWER FACTOR CONTROLLERS
Solar powered actuator with continuously variable auxiliary power control [NASA-CASE-MFS-25637-1] N85-21769
POWER LINES
Electromagnetic pulse (EMP) injection on cable entries, type ERA; EMP memo no. 10 [FOA-E-30003-A3] N85-21484
Study of electric field and ion effects on HVDC lines [DE85-002975] N85-21503
POWER PLANTS
Leak detectors for organic Rankine cycle power plants: On-line and manual methods [DE85-002792] N85-21617
POWER SPECTRA
MTF analysis of LANDSAT-4 Thematic Mapper N85-21737
POWER SUPPLY CIRCUITS
High-voltage, high-power, solid-state remote power controllers for aerospace applications [NASA-TP-2437] N85-21283
PREAMPLIFIERS
New preamplifier for particle detectors [DE85-004115] N85-21524
Tubes and transistors in audio amplifiers N85-21532
PREBURNERS
An investigation of space shuttle main engine shutdown chugging instability N85-22221

PRECIPITATION
Monthly and seasonal weather outlook for January 1985, volume 39, number 1
[PB85-148799] N85-21915
PRECIPITATION (METEOROLOGY)
Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations — meteorological radar
[DFVLR-FB-84-42] N85-21485
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
OSCAR experiment high-density network data report
[DE85-004907] N85-21826
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
On the wind error of the Finnish raingauge
[REPT-37] N85-21883
PRECIPITATORS
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
PREDICTION ANALYSIS TECHNIQUES
Improvement of VHF(MB) model
[AD-A150087] N85-21480
Numerical studies of fluid spin-up from rest in a partially-filled cylinder
[AD-A150079] N85-21586
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985
Predicting a future response using rank predictive probabilities
[MATHEMATICS-RESEARCH-166] N85-22077
PREDICTIONS
Modeling N85-21221
PREPREGS
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
PRESIDENTIAL REPORTS
President's private sector survey on cost control, report on research and development
[PB84-173269] N85-22253
PRESSURE DISTRIBUTION
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
An experimental investigation of flap turbulent heat transfer and pressure characteristics in hypersonic flow N85-21426
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
PRESSURE GAGES
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
PRESSURE GRADIENTS
Nested subcritical flows within supercritical systems
[NASA-TM-86960] N85-21574
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
PRESSURE MEASUREMENT
Unsteady transonic pressure measurements on a semi-span wind-tunnel model of a transport-type supercritical wing (Lann model). Part 2: Pressure distributions (plotted) and plots of the vibration modes
[AD-A130488] N85-21579
The seven-hole pressure probe
[AD-A149799] N85-21615
Method of and apparatus for measuring temperature and pressure — atmospheric sounding
[NASA-CASE-GSC-12558-1] N85-21639
Seismic observation of infrasonic signals
[AD-A149574] N85-21853
MFTF sensor verification computer program
[DE85-004452] N85-22029
PRESSURE OSCILLATIONS
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
An investigation of space shuttle main engine shutdown chugging instability N85-22221
PRESSURE SENSORS
Heat pipe cooled probe
[NASA-CASE-LAR-12588-1] N85-21568
The seven-hole pressure probe
[AD-A149799] N85-21615
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
PRINTED CIRCUITS
Printed circuit balun with a dipole antenna
[AD-D011534] N85-21498
Gain enhancement methods for printed circuit antennas
[AD-A150090] N85-21517
The state of the art in printed wiring board inspection
[AD-A149871] N85-21679
PRISMS
High resolution diffraction grating
[AD-D011541] N85-22141
PROBABILITY DENSITY FUNCTIONS
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel
[AD-A149586] N85-22110
PROBABILITY THEORY
The study of certain aspects of probability with applications in communications theory
[AD-A149820] N85-21476
Predicting a future response using rank predictive probabilities
[MATHEMATICS-RESEARCH-166] N85-22077
Proportional odds models for survival data and estimates using ranks
[MATHEMATICS-RESEARCH-172] N85-22080
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22089
Stable measures and processes in statistical physics
[AD-A149592] N85-22098
Reliability of structural brittle materials N85-22222
A statistical approach to vendor selection
[AD-A149781] N85-22249
PROBES
Heat pipe cooled probe
[NASA-CASE-LAR-12588-1] N85-21568
PROBLEM SOLVING
The application of expert systems to corrosion problems
[AERE-M-3445] N85-21316
On the accuracy of least squares methods in the presence of corner singularities
[NASA-CR-172552] N85-22050
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
PROCEDURES
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
A note on validity generalization procedures
[AD-A150065] N85-22085
PROCESS CONTROL (INDUSTRY)
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-3] N85-21350
Chemical approach for controlling nadimide cure temperature and rate with maleimide
[NASA-CASE-LEW-13770-4] N85-21351
Materials refining for solar cell silicon N85-21775
PROCESS HEAT
Solar process heat: Technology program
[BMFT-FB-T-84-234] N85-21812
PROCUREMENT
A statistical approach to vendor selection
[AD-A149781] N85-22249
PRODUCT DEVELOPMENT
Development of the sonic pump levitator
[NASA-CR-171382] N85-21186
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
Development of miniature laser Doppler anemometers
[KU-SFB-210/ET/3] N85-21648
Development and prototype construction of photovoltaic energy supply units N85-21781
Development of an amorphous silicon panel N85-21788
Development of high-efficiency economic systems for photovoltaics N85-21795
Development of a CdSe thin film solar cell N85-21796
Development of new solar cells N85-21797
PRODUCTION
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
PRODUCTION COSTS
Amorphous silicon solar cells with a view to cheap production processes N85-21789
PRODUCTION ENGINEERING
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
Silicon band spraying technique for solar cells N85-21778
Amorphous silicon solar cells with a view to cheap production processes N85-21789
Production and characterization of amorphous silicon (a-Si:H) as base material for solar cells N85-21791
Testing and optimization of the production technology of large-surface Cu2S/CdS solar generators N85-21793
PROFILOMETERS
Characterization of lubricated bearing surfaces operated under high loads
[NASA-TM-86964] N85-21357
PROGRAM VERIFICATION (COMPUTERS)
A Gypsy-to-Ada program compiler
[TR-39] N85-22005
Towards the generation of efficient code from verified programs
[TR-40] N85-22017
Ryan-McFarland Corporation, IBM PC model XT, RM/FORTRAN, version 2.0.0
[PB85-107993] N85-22037
Ryan-McFarland Corporation, sun microsystem with sky fast floating point processor, RM/FORTRAN version 1.5.0
[PB85-108009] N85-22038
Requirements for a database management system
[DE85-004661] N85-22259
PROGRAMMING LANGUAGES
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000
The four forms of omega
[AD-A149694] N85-22020
PROJECT MANAGEMENT
Air Force satellite position management N85-21217
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
PROJECT PLANNING
Systems research on China in year 2000 N85-21418
Global tropospheric chemistry: A plan for action
[NASA-CR-175545] N85-21865
PROPAGATION VELOCITY
Double reference pulsed phase locked loop (DRP-2L-2)
[NASA-CASE-LAR-13310-1] N85-21441
PROPELLANT EVAPORATION
An experimental study of spray thruster
[REPT-613] N85-21578
PROPELLANT SPRAYS
An experimental study of spray thruster
[REPT-613] N85-21578
PROPELLANT TESTS
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260
PROPELLANT TRANSFER
An investigation of space shuttle main engine shutdown chugging instability N85-22221
PROPELLERS
Propeller propulsion system integration: State of technology survey
[NASA-CR-3882] N85-21119
Towards a renewal of the propeller in aeronautics
[NASA-TM-77803] N85-21169
Further comparison of wind tunnel and airplane acoustic data for advanced design high speed propeller models
[NASA-TM-86935] N85-22108
PROPORTIONAL COUNTERS
In-beam tests of an air-core superconducting-solenoid particle spectrometer
[DE85-004029] N85-21625
PROPULSION SYSTEM CONFIGURATIONS
Propeller propulsion system integration: State of technology survey
[NASA-CR-3882] N85-21119
Towards a renewal of the propeller in aeronautics
[NASA-TM-77803] N85-21169
PROPULSION SYSTEM PERFORMANCE
Propeller propulsion system integration: State of technology survey
[NASA-CR-3882] N85-21119
Optimization of guidance and control using function minimization and NAVSTAR/GPS
[AD-A149956] N85-21141
PROTECTION
Hurricane storm surge research
[GPO-40-048] N85-21880
PROTECTIVE COATINGS
A study of intumescent reaction mechanisms
[AD-A149605] N85-21365
PROTECTORS
Windblast arm protector assembly
[AD-D011512] N85-21984

PROTEIN METABOLISM
Blood amino acids of cosmonauts before and after 211-day spaceflight N85-21933
PROTOCOL (COMPUTERS)
Multicomputer communication system [NASA-CASE-NPO-15433-1] N85-21428
PROTON BEAMS
Review of polarized proton beam techniques and a report on the workshop on polarized beams [DE85-004390] N85-22127
PROTON DENSITY (CONCENTRATION)
On the P1 data from GMS-SEM N85-21890
PROTON FLUX DENSITY
An atlas of polar cap energetic particle observations. Volume 2: NOAA-6, 8 July 1979 to 10 May 1983 [PB85-109072] N85-21868
PROTONS
Proton NMR and susceptibility measurements in TiCoH/sub x [DE85-003309] N85-21336
PROVING
A note on validity generalization procedures [AD-A150065] N85-22085
PROXIMITY
Focal plane array optical proximity sensor [NASA-CASE-NPO-15155-1] N85-22139
Design of an optical proximity sensor using multiple cones of light for measuring surface shape — application to a robot manipulator [AD-A150050] N85-22152
PSYCHOLOGICAL EFFECTS
Some individual differences in human response to infrasound [UTIAS-282] N85-21960
PSYCHOLOGICAL FACTORS
Task influences in the analytic-intuitive approach to decision making [AD-A149870] N85-22250
PSYCHOPHYSIOLOGY
Role of mental work in human tolerance in total-body vibration N85-21940
PULMONARY CIRCULATION
Human lung fluid content during 7-day head-down tilt N85-21941
Spiroll-2 instrument used to test pulmonary ventilation N85-21950
PULMONARY FUNCTIONS
Human lung fluid content during 7-day head-down tilt N85-21941
PULSARS
The axisymmetric pulsar magnetosphere N85-22279
Nonlinear waves in the magnetosphere of pulsars N85-22281
About static and dynamic solutions of the aligned rotator model — pulsar magnetospheres N85-22306
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313
The luminosity distribution of pulsars N85-22317
Discriminant analysis of pulsar groups in the diagram P versus P N85-22319
Pulsars and interstellar medium N85-22320
PULSE COMMUNICATION
The study of certain aspects of probability with applications in communications theory [AD-A149820] N85-21476
Digital channel efficiency model [AD-A150084] N85-21479
PULSE DOPPLER RADAR
Development of the F-20 nose radome [AD-P004374] N85-21468
PULSE DURATION
Estimating algorithmic error of digital recursive filters N85-21543
PULSE FREQUENCY MODULATION
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar [AD-D011561] N85-21436
PULSE GENERATORS
Power circuit utilizing self-excited Hall effect switch means [AD-D011505] N85-21496
PULSE MODULATION
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
PULSE RADAR
Low sidelobe phased array antenna system [AD-D011558] N85-21435
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar [AD-D011561] N85-21436
Summator of radio pulse signals N85-21539
PULSE REPETITION RATE
Pulse transformer package for impedance matching a laser diode to a transmission line [AD-D011499] N85-21632
PULSED LASERS
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique [AD-D011548] N85-21281
PULSES
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel [AD-A149598] N85-22110
Surface forward scattering and reflection [AD-A150115] N85-22112
Strong iron accelerating by collisionless magnetosonic shock wave propagating perpendicular to a magnetic field [IPPJ-709] N85-22161
PURITY
Carbothermic production of silicon solar cells using high-purity starting materials N85-21777
PYRIDINES
Electrochemistry and electrochemical methodology in molten salts [AD-A149613] N85-21284
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver [AD-A150109] N85-21294
PYROLYSIS
Synthesis, static and reactive characterization of supported organometallics [DE85-004285] N85-21340
Low cost, sprayed CuInSe2 solar cell research [DE85-003467] N85-21799
Methods/materials matrix of ultimate disposal techniques for spilled hazardous materials [PB85-116853] N85-21833

Q

Q SWITCHED LASERS
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
Investigation of plasma processes in electronic transition lasers [AD-A149682] N85-21506
QUADRATIC PROGRAMMING
Automatic control design procedures for restructurable aircraft control [NASA-CR-172489] N85-21173
User's guide for NPSOL (Version 2.1): A FORTRAN package for quadratic programming [AD-A150078] N85-22028
QUADRATURES
A note on the use of polynomial transformations in evaluating singular integrals [MATHEMATICS-RESEARCH-165] N85-22053
The implementation of the Tanh transformations in the evaluation of singular integrals [MATHEMATICS-RESEARCH-171] N85-22054
QUADRUPOLES
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
QUALITY CONTROL
Transportation [JPRS-UTR-85-004] N85-21105
Aviation repair plant directors on quality control measures N85-21106
Development and evaluation of a procedure for the rapid analysis of fresh concrete [AD-A149741] N85-21703
A statistical approach to vendor selection [AD-A149781] N85-22249
QUANTUM CHROMODYNAMICS
Jet topologies in hadron-hadron collisions [DE85-001328] N85-22119
Research in theoretical nuclear physics [DE85-004349] N85-22137
QUANTUM THEORY
Stable measures and processes in statistical physics [AD-A149592] N85-22098
QUARKS
Research in theoretical nuclear physics [DE85-004349] N85-22137
QUARTZ
Oscillator development [AD-A149699] N85-21509
Normal coordinate monolithic crystal filter [AD-D011496] N85-22188
Stress compensation crystal device [AD-D011497] N85-22189
QUARTZ CRYSTALS
Quartz filter transceiver N85-21538
QUASARS
The ultraviolet excess of quasars 3: The highly polarized quasars PKS 0736+017 and PKS 1510-089 [NASA-CR-175576] N85-22268

R

RADAR
In situ orbital debris experiment concepts N85-21198
The ambiguity function and the Wigner distribution [AD-A150095] N85-21482
RADAR ANTENNAS
Low sidelobe phased array antenna system [AD-D011558] N85-21435
Development of the F-20 nose radome [AD-P004374] N85-21468
RADAR CROSS SECTIONS
Numerical methods for analyzing electromagnetic scattering [NASA-CR-175507] N85-21438
RADAR DATA
Digital coherent detector [AD-D011560] N85-21501
RADAR DETECTION
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
Use of ground radar to detect reentering debris N85-21200
RADAR ECHOES
Digital coherent detector [AD-D011560] N85-21501
Preliminary results of associating cloud-to-ground lightning with surface convergence and radar reflectivity at Kennedy Space Center in 1983 [NASA-CR-175543] N85-21910
RADAR EQUIPMENT
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
RADAR IMAGERY
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution [AD-A150098] N85-21483
The imaging of internal waves by the SEASAT-A synthetic aperture radar [AD-A149808] N85-21761
RADAR MEASUREMENT
Radar calibration using direct measurement equipment and oblique photometry [AD-D011530] N85-21433
Experimental test of the three subaperture method for estimating target elevation angle [AD-A149687] N85-21614
RADAR RECEIVERS
Multiple loop sidelobe canceller [AD-D011533] N85-21434
Digital coherent detector [AD-D011560] N85-21501
Summator of radio pulse signals N85-21539
RADAR SCATTERING
Oceanographic and meteorological research based on the data products of SEASAT [E85-10091] N85-21753
RADAR TRACKING
Fundamental limits to synchronization and tracking [AD-A149823] N85-21504
RADIAL FLOW
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231
RADIANCE
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
MTF analysis of LANDSAT-4 Thematic Mapper N85-21737
GMS operational calibration procedure and status N85-21893
Analysis of selective chopper radiometer data [NASA-CR-175157] N85-21894
RADIATION ABSORPTION
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique [AD-D011548] N85-21281
Control of electronic, magnetic and optical properties of doped polyacetylene conductors [AD-A150117] N85-21375
RADIATION COUNTERS
New preamplifier for particle detectors [DE85-004115] N85-21524
On the P1 data from GMS-SEM N85-21890
RADIATION DETECTORS
New preamplifier for particle detectors [DE85-004115] N85-21524
RADIATION DISTRIBUTION
Numerical methods for analyzing electromagnetic scattering [NASA-CR-175507] N85-21438

RADIATION DOSAGE
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories
[NASA-TM-86946] N85-21228
Biological effects on radiofrequency radiation
[PB85-120848] N85-21930
RADIATION EFFECTS
Effects of neutron irradiation on the fracture properties of HT-9 weld
[DE85-001068] N85-21339
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925
Biological effects on radiofrequency radiation
[PB85-120848] N85-21930
Irradiation effects on fuels for space reactors
[DE84-016460] N85-22134
RADIATION HAZARDS
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962
RADIATION INJURIES
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962
RADIATION MEASUREMENT
Radio Frequency Radiation (RFR) measurements in operational settings
[AD-A149717] N85-21471
RADIATION PROTECTION
Radio Frequency Radiation (RFR) measurements in operational settings
[AD-A149717] N85-21471
RADIATION SOURCES
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154
RADIATIVE TRANSFER
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
Atlas of relectance patterns for uniform earth and cloud surfaces (NIMBUS-7ERB-61 days)
[PB85-116382] N85-21870
RADICALS
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals
[NASA-TM-83800] N85-22204
RADIO ANTENNAS
An electronically-steerable active receiving array for h.f.
[BBC-RD-1985/2] N85-21430
RADIO COMMUNICATION
Radioelectronics and space exploration N85-21533
Satellite communications and amateur radio N85-21534
RADIO DIRECTION FINDERS
Direction finder set, radio
[AD-A149958] N85-21142
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149687] N85-21614
RADIO EQUIPMENT
Satellite communications and amateur radio N85-21534
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
RADIO FILTERS
Quartz filter transceiver N85-21538
RADIO FREQUENCIES
Biological effects on radiofrequency radiation
[PB85-120848] N85-21930
RADIO FREQUENCY DISCHARGE
The effects of surface waves on RF discharge pumped lasers
[AD-A149689] N85-21643
RADIO FREQUENCY HEATING
Computer simulation of equipment and processes involved in high-frequency heating of dielectrics N85-21555
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172
RADIO GALAXIES
Determination of physical parameters of jets in radio galaxies N85-22304
Magnetohydrodynamic (MHD) turbulence in radio galaxies N85-22305
RADIO METEOROLOGY
Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations — meteorological radar
[DFVLR-FB-84-42] N85-21485
RADIO OCCULTATION
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327
RADIO PROBING
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846
RADIO RECEIVERS
Synthesis of optimum receiver and processor for signal packet of radio pulses N85-21541
RADIO SIGNALS
Digital coherent detector
[AD-D011560] N85-21501
Summator of radio pulse signals N85-21539
RADIO SOURCES (ASTRONOMY)
A new radio emission at 3 kHz in the outer heliosphere N85-22312
RADIO TRANSMISSION
L.F. RADIO-DATA: Specification of BBC phase-modulated transmissions on long-wave
[BBC-RD-1984/19] N85-21431
RADIO TRANSMITTERS
Adaptive regulation of transmitter radiation power in radio lines during delays of control signals N85-21551
RADIO WAVES
Radio Frequency Radiation (RFR) measurements in operational settings
[AD-A149717] N85-21471
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962
RADIOACTIVE MATERIALS
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting
[DE85-002503] N85-21185
RADIOACTIVE WASTES
Shallow land burial technology: Humid
[DE85-004432] N85-22136
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138
RADIOGRAPHY
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride
[NASA-TM-86945] N85-21674
A new NDE (Non-Destructive Evaluation) capability for thin-shelled structures
[AD-A149625] N85-21678
RADIOMETERS
Liquid fuel spray processes in high-pressure gas flow
[NASA-TM-86944] N85-21570
Microprocessor-controlled rotating shadowband radiometer
[DE85-003633] N85-21630
Monolithic short wave infrared (SWIR) detector array
[NASA-CR-175284] N85-21759
Analysis of selective chopper radiometer data
[NASA-CR-175157] N85-21894
RADIOMETRIC CORRECTION
A preliminary assessment of LANDSAT-4 Thematic Mapper data — Windsor, Ontario and Medicine Hat areas, Canada N85-21728
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors — New Mexico N85-21733
LANDSAT-4 Thematic Mapper calibration and atmospheric correction N85-21734
Scan angle and detector effects in Thematic Mapper radiometry — Iowa and Arkansas N85-21735
RADIOMETRIC RESOLUTION
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures — Illinois N85-21731
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
The use of linear feature detection to investigate Thematic Mapper data performance and processing N85-21740
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
LANDSAT 4 band 6 data evaluation
[E85-10093] N85-21755
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
VISSR infrared calibration by means of calculated radiances N85-21880
RADIOSONDES
Wind-weighting for sounding rockets with a telemetry system
[NASA-TP-2438] N85-21246
RADOME MATERIALS
Proceedings of the Symposium on Electromagnetic Windows (17th) held at Georgia Inst. of Technology, Engineering Experiment Station, Atlanta, Georgia on 25-27 July 1984. Part 2
[AD-A149125] N85-21444
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
Pressureless sintered silicon nitride as a promising candidate for radome materials
[AD-P004367] N85-21461
LL-100: A new polybutadiene (resin system for radome applications)
[AD-P004368] N85-21462
Broadband thermoplastic radomes
[AD-P004369] N85-21463
Development of a high temperature single impact rain erosion test capability
[AD-P004371] N85-21465
RADOMES
Electromagnetic analysis of radomes by the moment method
[AD-P004351] N85-21445
A computer analysis of the RF performance of a ground-mounted, air-supported radome
[AD-P004352] N85-21446
Comparison of spherical wave ray tracing and exact boundary value solutions for spherical radomes
[AD-P004353] N85-21447
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449
Near-field effects on radome boresight errors
[AD-P004356] N85-21450
Dual band radome wall design
[AD-P004357] N85-21451
Study of laminated dielectric behavior at microwave and millimeter-wave frequencies
[AD-P004358] N85-21452
Image lobe analysis for large radomes
[AD-P004359] N85-21453
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454
A millimeter wave apparatus for free-space measurement of dielectric constants at high temperature
[AD-P004361] N85-21455
Automated radome testing
[AD-P004362] N85-21456
Hot radome boresight error measurements
[AD-P004364] N85-21458
A broadband kevlar radome for shipboard
[AD-P004365] N85-21459
Fiber reinforced fused silica for hypersonic radome applications
[AD-P004366] N85-21460
LL-100: A new polybutadiene (resin system for radome applications)
[AD-P004368] N85-21462

Broadband thermoplastic radomes
[AD-P004369] N85-21483
Infrared material optical damage by rain
[AD-P004372] N85-21466
A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467
Development of the F-20 nose radome
[AD-P004374] N85-21468
Nose and inlet duct radomes for the firebolt aerial target
[AD-P004375] N85-21469

RAILGUN ACCELERATORS
Rail accelerator technology and applications
[NASA-TM-86947] N85-21258
Arc-driven rail gun research
[NASA-CR-174818] N85-21662
Plasma mass and effective inductance in a small railgun
[MRL-R-947] N85-22162

RAIN
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825
OSCAR experiment high-density network data report
[DE85-004907] N85-21826

RAIN EROSION
Development of a high temperature single impact rain erosion test capability
[AD-P004371] N85-21465
Infrared material optical damage by rain
[AD-P004372] N85-21466

RAIN GAGES
On the wind error of the Finnish raingauge
[REPT-37] N85-21883

RAMAN SPECTRA
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver
[AD-A150109] N85-21294
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312

RAMAN SPECTROSCOPY
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver
[AD-A150109] N85-21294

RANDOM VARIABLES
Maximum matchings in a class of random graphs
[AD-A149663] N85-22060
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069
Convergence rates in the strong law for bounded mixing sequences
[CWI-MS-R8412] N85-22076

RANK TESTS
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
Simplifications and approximations for linear rank statistics with censored data
[MATHEMATICS-RESEARCH-161] N85-22079

RANKINE CYCLE
Leak detectors for organic Rankine cycle power plants: On-line and manual methods
[DE85-002792] N85-21617
Direct-contact condensers for solar pond power production
[DE84-004510] N85-21771
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802

RANKING
Predicting a future response using rank predictive probabilities
[MATHEMATICS-RESEARCH-166] N85-22077
Proportional odds models for survival data and estimates using ranks
[MATHEMATICS-RESEARCH-172] N85-22080
Use of ranks to fit a linear model to cross-sectional data with an application to biological rhythms
[MATHEMATICS-RESEARCH-169] N85-22081

RARE GASES
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149825] N85-21581
Experimental study of steam condensation on water in countercurrent flow in presence of inert gases
[DE84-013028] N85-21800

RATS
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966

RAY TRACING
Electromagnetic analysis of radomes by the moment method
[AD-P004351] N85-21445
Comparison of spherical wave ray tracing and exact boundary value solutions for spherical radomes
[AD-P004353] N85-21447
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449
Image lobe analysis for large radomes
[AD-P004359] N85-21453
Surface forward scattering and reflection
[AD-A150115] N85-22112

RAYLEIGH SCATTERING
LANDSAT-4 Thematic Mapper calibration and atmospheric correction N85-21734

RAYLEIGH WAVES
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves
[AERE-R11483] N85-22203

REACTION BONDING
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride
[NASA-TM-86945] N85-21674

REACTION KINETICS
A comparison of the efficiency of numerical methods for integrating chemical kinetic rate equations
[NASA-TM-83590] N85-21162
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
Kinetics of nitric oxide formation in laminar and turbulent methane combustion
[PB85-149698] N85-21313
A study of intumescent reaction mechanisms
[AD-A149605] N85-21365
Optically pumped iodine monofluoride laser
[AD-D011555] N85-21637
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849
State-selected ion-molecule reaction dynamics
[AD-A150068] N85-22115
Theoretical nuclear physics
[DE85-003466] N85-22135

REACTION TIME
Choice reaction time and color: An annotated bibliography
[AD-A149722] N85-21979
Fast times at high temperatures
[DE85-003306] N85-22205

REACTOR DESIGN
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22168

REACTOR SAFETY
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
Proceedings of the 1984 DOE Nuclear Reactor and Facility Safety Conference, volume 1
[DE84-012130] N85-22132
Proceedings of the DOE Nuclear Reactor and Facility Safety Conference, volume 2
[DE84-012664] N85-22133

REAL TIME OPERATION
Interface specifications for SCR (Software Cost Reduction) (A-7E) extended computer module, revised
[AD-A149948] N85-22024

RECEIVERS
Direction finder set, radio
[AD-A149958] N85-21142
Solid particle receiver experiments: Velocity measurements
[DE85-000257] N85-21623
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723

RECORDING
Device for controlling operation of lithicon cathode-ray memory tube N85-21542

RECORDS
Chronology of KSC and KSC related events for 1983
[NASA-TM-87435] N85-22339

RECRYSTALLIZATION
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193

RECTANGLES
An experimental investigation of an underexpanded rectangular jet ejector
[AD-A149656] N85-21170

RECTANGULAR PANELS
Noise transmission loss of a rectangular plate in an infinite baffle
[NASA-TP-2396] N85-22109

RECTANGULAR PLANFORMS
An investigation of compressible flows over open cavities including shear layer thickness effects
[AD-A150086] N85-21588

RECURSIVE FUNCTIONS
Recursive moment formulas for regenerative simulation
[AD-A150112] N85-22070

RECYCLING
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828

REDUCED GRAVITY
Modular plant culture systems for life support functions
[NASA-CR-171853] N85-21924
Investigation of foam flotation and phase partitioning techniques N85-22216

REDUCED ORDER FILTERS
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545

REDUCTION (CHEMISTRY)
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340
Polymeric electrolytes for ambient temperature lithium batteries
[DE85-001032] N85-21518

REDUNDANCY
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154

REDUNDANCY ENCODING
Redundancy of codes for detection and correction of unidirectional errors N85-21557

REENTRY
Use of ground radar to detect reentering debris N85-21200

REFINING
Improved silicon grinding method and apparatus
[NASA-CASE-NPO-16336-1-CU] N85-21407
Materials refining for solar cell silicon N85-21775

REFLECTANCE
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors --- New Mexico N85-21733
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10082] N85-21747
Atlas of relectance patterns for uniform earth and cloud surfaces (NIMBUS-7ERB-61 days)
[PB85-116382] N85-21870
A study of low-level laser retinal damage
[AD-A150046] N85-21965

REFLECTION
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
Near-field effects on radome boresight errors
[AD-P004356] N85-21450
Image lobe analysis for large radomes
[AD-P004359] N85-21453
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
Analysis and computations of microwave-atmospheric interactions
[AD-A149666] N85-21854
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859

REFRACTIVITY
Imaging apparatus for transverse electrode electro-optic tunable filter
[AD-D011524] N85-21497

REFRACTORY COATINGS
Thermal barrier coating system
[NASA-CASE-LEW-13324-2] N85-21266

REFRACTORY MATERIALS
Nonlinear analysis for high-temperature multilayered fiber composite structures --- turbine blades
[NASA-TM-83754] N85-21273

Viscoplastic constitutive relationships with dependence on thermomechanical history
[NASA-CR-174836] N85-21691

REFRACTORY METALS
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293
Update of thermal conductivity and electrical resistivity of electrolytic iron, tungsten and stainless steel
[PB85-115814] N85-21311

REFRIGERATING MACHINERY
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404

REFRIGERATORS
Gas-fired duplex free-piston Stirling refrigerator N85-21413

REGENERATION (ENGINEERING)
Recursive moment formulas for regenerative simulation
[AD-A150112] N85-22070

REGRESSION ANALYSIS
A note on some simple influence diagnostics in accelerated life testing
[AD-A149593] N85-21677
Analysis of selective chopper radiometer data
[NASA-CR-175157] N85-21894
Ordinary and proper location M-estimates for ARMA models, revised
[AD-A149705] N85-22061
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
Proportional odds models for survival data and estimates using ranks
[MATHEMATICS-RESEARCH-172] N85-22080
Pulsars and interstellar medium N85-22320

REGRESSION COEFFICIENTS
A two-dimensional smoothing spline and a regression problem
[AD-A149824] N85-22067

REGULATIONS
Ultralight aircraft technology and public safety
[GPO-38-948] N85-21131

REGULATORS
Adaptive regulation of transmitter radiation power in radio lines during delays of control signals N85-21551

REISSNER THEORY
Interaction of part-through cracks in a flat plate
[NASA-CR-175588] N85-21692

RELATIVISTIC ELECTRON BEAMS
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116

RELATIVISTIC PLASMAS
On the spectrum of longitudinal waves in the hot degenerate plasma N85-22280
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297

RELATIVITY
Drag-free satellite simulator
[REPT-615] N85-21229
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608
Conserved quantities and radiative aspects of asymptotically anti-de Sitter space-times N85-22303

RELIABILITY
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems
[DE84-004521] N85-21770
AFOS (Automation of Field Operations and Services)-ERA forecast verification, September 1984
[PB85-137578] N85-21912
Reliability of structural brittle materials N85-22222

RELIABILITY ANALYSIS
Reliability analysis of automatic systems
[VTT-301] N85-21682

REMOTE CONTROL
A remotely controlled orbiting retriever N85-21212

REMOTE SENSING
In situ orbital debris experiment concepts N85-21198
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
Workshop on Remote Sensing/Lineament Applications for Energy Extraction
[DE84-009291] N85-21763
Method and apparatus for calibrating the ionosphere and application to surveillance of geophysical events
[NASA-CASE-NPO-15430-1] N85-21846

REMOTE SENSORS
Remote self-contained undersea monitor
[AD-D011520] N85-21599
Method of and apparatus for measuring temperature and pressure — atmospheric sounding
[NASA-CASE-GSC-12558-1] N85-21639
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741

REMOVAL
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers
[ARL-MAT-R-117] N85-21326
Hazardous air pollutants: Dry-deposition phenomena
[PB85-136279] N85-21843

REPLACING
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21680

REPORTS
Transportation
[JPRS-UTR-85-004] N85-21105

REQUIREMENTS
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-86599] N85-21609
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22338

RESEARCH
China report: Science and technology
[JPRS-CST-85-008] N85-21416
Report on the Second Annual Review Meeting of the National Acid Precipitation Assessment Program. Research to assist decisionmaking: Summary
[DE85-003003] N85-21820
Bibliography of Lewis Research Center technical publications announced in 1983
[NASA-TM-83693] N85-22255

RESEARCH AND DEVELOPMENT
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
An agenda for a study of government science policy
[GPO-40-860] N85-22245
President's private sector survey on cost control, report on research and development
[PB84-173269] N85-22253
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22338
Research and technology: Fiscal year 1984 report
[NASA-TM-85231] N85-22340

RESEARCH FACILITIES
Computing Division two-year operational plan, FY 1984 - 1985
[LA-9978-MS] N85-22006
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22338

RESEARCH MANAGEMENT
Systems research on China in year 2000 N85-21418
Global tropospheric chemistry: A plan for action
[NASA-CR-175545] N85-21865
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22338

RESIDENTIAL ENERGY
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806

RESIDUAL STRESS
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves
[AERE-R11483] N85-22203

RESINS
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372
Characterization and optimization of polyethylene resins and gas pipe
[PB85-118511] N85-21382

RESISTANCE HEATING
Reducing electric power losses in discharge chamber of induction plasmatron N85-21553

RESISTANCE THERMOMETERS
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
MFTF sensor verification computer program
[DE85-004452] N85-22029

RESISTOJET ENGINES
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260

RESONANCE
Gain enhancement methods for printed circuit antennas
[AD-A150090] N85-21517

RESONANT FREQUENCIES
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528

RESONANT VIBRATION
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104

RESONATORS
Oscillator development
[AD-A149699] N85-21509
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528
Stress compensation crystal device
[AD-D011497] N85-22189

RESOURCE ALLOCATION
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215

RESOURCES MANAGEMENT
Remote sensing research for agricultural applications — San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho
[E85-10090] N85-21752
Building a functional, integrated GIS/remote sensing resource analysis and planning system — Utah
[E85-10092] N85-21754
Review of computer mapping and display techniques applicable to regional analysis
[DE85-003545] N85-21764
A formal method for specifying computer resources in an implementation independent manner
[AD-A149955] N85-22043

RESPIRATION
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
Main component method used to study variations of cardiovascular parameters N85-21939
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966

RESPIRATORY RATE
External respiration, gas exchange and energy expenditures of man in weightlessness N85-21932

RESPIRATORY SYSTEM
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838
Human lung fluid content during 7-day head-down tilt N85-21941
Spirolit-2 instrument used to test pulmonary ventilation N85-21950

RESPONSES
Temperature responses of composite panels
[AD-A150053] N85-21277
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation
[DE85-001742] N85-21621

RETINA
A study of low-level laser retinal damage
[AD-A150046] N85-21965

RETINAL IMAGES
Retinal information mapping system
[AD-D011531] N85-21601

REUSABLE HEAT SHIELDING
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive
[NASA-CR-175565] N85-21242

REUSABLE SPACECRAFT
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion
[NASA-TM-86969] N85-21231

REVIEWING
A review of some aspects of robust inference for time series
[AD-A149706] N85-22062

REYNOLDS NUMBER
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572

Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573

RHENIUM
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260

RHEOLOGY
Rheology of dissemination
[AD-A150006] N85-21373

RHODIUM
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149813] N85-21291
Advanced thin film thermocouples
[NASA-CR-175541] N85-21607

RHYTHM (BIOLOGY)
Effect of stationary magnetic field on bleeding time N85-21956
Use of ranks to fit a linear model to cross-sectional data with an application to biological rhythms
[MATHEMATICS-RESEARCH-169] N85-22081

RIBS (SUPPORTS)
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-408] N85-21699

RIEMANN MANIFOLD
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071

RIGGING
Behavior of the lean methane-air flame at zero-gravity
[NASA-CR-175586] N85-21283

RIGID STRUCTURES
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693

RING STRUCTURES
Torso sizing ring construction for hard space suit
[NASA-CASE-ARC-11616-1] N85-21987

ROBOTICS
Dynamic world modeling for an intelligent mobile robot using a rotating ultra-sonic ranging device
[AD-A149979] N85-21143
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
Mechanical properties for the grasp of a robotic hand
[AD-A150062] N85-21669
A formal method for specifying computer resources in an implementation independent manner
[AD-A149955] N85-22043
Design of an optical proximity sensor using multiple cones of light for measuring surface shape — application to a robot manipulator
[AD-A150050] N85-22152
Sensor control of robot arc welding N85-22233

ROBOTS
Navigation for an intelligent mobile robot
[AD-A150051] N85-21144
A functional vehicle for autonomous mobile robot research
[AD-A150052] N85-21666
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
Mechanical properties for the grasp of a robotic hand
[AD-A150062] N85-21669
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243

ROBUSTNESS (MATHEMATICS)
Automatic control design procedures for restructurable aircraft control
[NASA-CR-172489] N85-21173
A review of some aspects of robust inference for time series
[AD-A149706] N85-22082
Asymptotics for configural estimators
[AD-A150106] N85-22087

ROCKET ENGINE CASES
Integrated insulation wall assembly — for a solid rocket motor case
[AD-D011553] N85-21257

ROCKET ENGINES
Ring-cusp ion thruster with shell anode
[NASA-CASE-LEW-13881-1] N85-21256
An experimental study of spray thruster
[REPT-613] N85-21578

ROCKET EXHAUST
Particle size, number, composition and velocity from solid rocket motors N85-21201

ROCKET SOUNDING
Rocket observations of the ionosphere during the eclipse of 26 February 1979
[NASA-CR-175513] N85-21850
Experiment for measuring electric fields within the sounding rocket project Energy Budget
[BMFT-FB-W-84-048] N85-21866

ROCKET-BORNE INSTRUMENTS
An improved rocket-borne electric field meter for the middle atmosphere
[NASA-CR-175510] N85-21851

ROCKY MOUNTAINS (NORTH AMERICA)
Measurements of the surface energy budget in the southern Gobi Desert of China, and in the Rocky Mountains of Colorado
[NASA-CR-175506] N85-21847

ROLLER BEARINGS
Lubrication and performance of high-speed rolling-element bearings
[NASA-TM-86958] N85-21658

ROOFS
Photovoltaic roofing tile systems N85-21783
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881

ROOMS
Acoustic scaling: A re-evaluation of the acoustic model of Manchester Studio 7
[BBC-RD-1984/18] N85-21432

ROTARY ENGINES
Stratified charge rotary aircraft engine technology enablement program
[NASA-CR-174812] N85-21163

ROTATING ENVIRONMENTS
Small scale structure and the Spinar model for active galactic nuclei N85-22316

ROTATING PLASMAS
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004568] N85-22171
About static and dynamic solutions of the aligned rotator model — pulsar magnetospheres N85-22306

ROTATING SHAFTS
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines
[NASA-TM-86926] N85-21569

ROTATING STALLS
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3878] N85-21117

ROTATION
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries
[DE85-004598] N85-22201

ROTOR AERODYNAMICS
Analytical and flight investigation of the influence of rotor and other high-order dynamics on helicopter flight-control system bandwidth
[NASA-TM-86696] N85-21174
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210

ROTOR BLADES (TURBOMACHINERY)
High pressure turbine rotor two-piece blade retainer
[AD-D011498] N85-21653
Cooled turbine blade tip closure
[AD-D011525] N85-21654

ROTORS
Singular asymptotic expansions in nonlinear rotordynamics N85-22218

ROUTES
Local search in routing problems with time windows
[CWI-OS-R8409] N85-22075

RUBBER
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179
Rubber modified epoxy adhesive
[AD-D011527] N85-21354
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408

RUNGE-KUTTA METHOD
Electromagnetic rail launcher as a circuit element
[AD-A150067] N85-21516
The performance of a type-insensitive Runge-Kutta code on a personal computer
[TUM-I8410] N85-22048

RUNWAY LIGHTS
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting
[DE85-002503] N85-21185

RUNWAYS
New runway enables IL-76 flights to Tenkeli in far north N85-21108
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184

RUPTURING
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data
[AD-A149810] N85-21275

RURAL AREAS
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting
[DE85-002503] N85-21185

RUSTING
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor
[DE85-003663] N85-21337

S

S GLASS
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data
[AD-A149810] N85-21275

SACCADIC EYE MOVEMENTS
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967

SADDLE POINTS (GAME THEORY)
General saddlepoint approximations with applications to l-statistics
[AD-A150073] N85-22086

SAFETY
Ultralight aircraft technology and public safety
[GPO-38-948] N85-21131
General-purpose heat source developmet: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128

SAFETY MANAGEMENT
Aerospace Safety Advisory Panel
[NASA-TM-87428] N85-21135
Geosynchronous satellite collision avoidance N85-21197
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129

SALINITY
Hydrographic data collected in 1982 and 1983 for EPOCS (Equatorial Pacific Ocean Climate Studies)
[PB85-110799] N85-21765

SAMPLING
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
Simplifications and approximations for linear rank statistics with censored data
[MATHEMATICS-RESEARCH-161] N85-22079

SAPPHIRE
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability
[AD-A150004] N85-21515

The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184

SATELLITE ATMOSPHERES
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327

SATELLITE ATTITUDE CONTROL
Application of model following control and estimation techniques to attitude control of maneuvering spacecraft. Part 2: Simulation software description
[NLR-TR-82116-U-PT-2] N85-21254

SATELLITE CONFIGURATIONS
Multimission advanced configurations study — telecommunication satellites
[MATRA-DM.51/CC/FL/0151.83] N85-21237

SATELLITE CONTROL
Definition of ground test for Large Space Structure (LSS) control verification
[NASA-TM-86495] N85-21249

SATELLITE DESIGN
Drag-free satellite simulator
[REPT-615] N85-21229
Multimission advanced configurations study — telecommunication satellites
[MATRA-DM.51/CC/FL/0151.83] N85-21237

SATELLITE DRAG
Drag-free satellite simulator
[REPT-615] N85-21229

SATELLITE IMAGERY
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
A preliminary assessment of LANDSAT-4 Thematic Mapper data — Windsor, Ontario and Medicine Hat areas, Canada N85-21728
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures — Illinois N85-21731
TM geometric performance: Line to Line Displacement Analysis (LLDA) — New Mexico N85-21732
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors — New Mexico N85-21733
Scan angle and detector effects in Thematic Mapper radiometry — Iowa and Arkansas N85-21735
Thematic Mapper spectral dimensionality and data structure N85-21736
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
Meteorological Satellite Center Technical Note No. 10, 1984
[MSC-TN-10] N85-21884
On the relative motion of typhoons: In the case of Typhoon 8305 and Typhoons 8306 and 8307 N85-21885
Accuracy of typhoon center determined by GMS imagery N85-21887
The development of image processing of NOAA AVHRR data and its application to sea surface temperature N85-21891
A supplement study on the subsynoptic cloud system off the south coast of Japan N85-21892

SATELLITE INSTRUMENTS
Development of Faraday cup onboard MS-T5 for solar wind measurements
[REPT-616] N85-21255

SATELLITE NAVIGATION SYSTEMS
Program INNAVSAT: Global Positioning System (GPS): Test and demonstration program
[BMFT-FB-W-84-047] N85-21145

SATELLITE ORBITS
Proposed preliminary design criteria model environment for the 1990's N85-21194
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Air Force satellite position management N85-21217
Engineering calculations for communications satellite systems planning
[NASA-CR-175552] N85-21233

SATELLITE ROTATION
Development of Faraday cup onboard MS-T5 for solar wind measurements
[REPT-616] N85-21255
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225

SATELLITE TRACKING
Orbital Debris
[NASA-CP-2360] N85-21186
NORAD operational system N85-21189
History of satellite break-ups in space N85-21190
Geosynchronous satellite collision avoidance N85-21197

SATELLITE TRANSMISSION
Brussels Satellite Convention
[S-EXEC-REPT-98-52] N85-21234

SATELLITE-BORNE INSTRUMENTS
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741
On the P1 data from GMS-SEM N85-21890

SATELLITES
Modeling N85-21221

SAWS
Ingot slicing machine and method
[NASA-CASE-NPO-15483-1] N85-21650

SCALARS
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071

SCALE MODELS
Acoustic scaling: A re-evaluation of the acoustic model of Manchester Studio 7
[BBC-RD-1984/18] N85-21432
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings
[AD-A149748] N85-21704

SCANNING
New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616

SCATHA SATELLITE
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252

SCATTERING
An iteration method for complex scattering problems
[AD-A150038] N85-22151
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions
[DE85-000887] N85-22192
Paramagnetic scattering from Ni
[DE85-004207] N85-22198

SCATTERING COEFFICIENTS
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique
[AD-D011548] N85-21281

SCATTERING CROSS SECTIONS
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126

SCHEDULING
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21680
State dependent priority rules for scheduling
[AD-A149972] N85-22090

SCIENTIFIC SATELLITES
Drag-free satellite simulator
[REPT-615] N85-21229
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855

SCREW DISLOCATIONS
Fracture toughness of materials
[DE85-004306] N85-21713

SEA ICE
Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1982
[AD-A149595] N85-21917

SEA SURFACE TEMPERATURE
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723
The development of image processing of NOAA AVHRR data and its application to sea surface temperature N85-21891

SEALERS
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products
[AD-A149777] N85-21368

SEALS (STOPPERS)
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408

SEARCH PROFILES
Local search in routing problems with time windows
[CWI-OS-R8409] N85-22075
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260

SEAS
Studies of the development of cyclones over Southern China coastal areas and adjacent seas
[AD-A150108] N85-21901
Preliminary results of the oceanographic cruise of USCGC NORTHWIND to the Greenland Sea
[AD-A149802] N85-21919

SEASAT SATELLITES
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays
[PB85-129841] N85-21767

SECURITY
Brussels Satellite Convention
[S-EXEC-REPT-98-52] N85-21234

SEGMENTS
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612

SEISMIC WAVES
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida
[AD-A149869] N85-22111

SEISMOLOGY
Seismic observation of infrasonic signals
[AD-A149574] N85-21853

SELECTORS
High-frequency input device for superheterodyne radio receiver with wideband preselector N85-21540

SEMICONDUCTING FILMS
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177

SEMICONDUCTOR DEVICES
Inelastic tunnel diodes
[NASA-CASE-LEW-13833-1] N85-21492
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177
Investigation of device and electronic interactions in GaAs device processing
[AD-A149747] N85-22182
Electrical performance of semiconductor devices at cryogenic temperatures N85-22239

SEMICONDUCTOR DIODES
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632

SEMICONDUCTOR LASERS
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632

SEMICONDUCTORS (MATERIALS)
GaAs and 3-5 compound solar cells status and prospects for use in space
[NASA-TM-86960] N85-21261
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177
Total immersion crystal growth
[NASA-CASE-NPO-15800-2] N85-22178
Semiconductor materials for high frequency solid state sources
[AD-A150020] N85-22186
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228

SENSITIVITY
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride
[NASA-TM-86945] N85-21674
Structural sensitivity analysis: Methods, applications and needs
[NASA-TM-85827] N85-21695
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rhesus monkeys N85-21946
A user's guide to sensitivity testing on computer models at Los Alamos National Laboratory
[LA-10104-M] N85-22018

SENSORIMOTOR PERFORMANCE
Role of mental work in human tolerance in total-body vibration N85-21940

SENSORS
NORAD operational system N85-21189
SEPARATED FLOW
Vacuum chamber pressure effects on thrust measurements of low Reynolds number nozzles [NASA-TM-86955] N85-21259
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature [AD-A149657] N85-21580
SEPARATION
Investigation of foam flotation and phase partitioning techniques N85-22216
SEPARATORS
Improved silicon grinding method and apparatus [NASA-CASE-NPO-16336-1-CU] N85-21407
Supported liquid membrane battery separators [DE85-001031] N85-21519
Research on separators for alkaline zinc batteries [DE85-003082] N85-21523
Magnetic field in main gap of separator N85-21563
SEQUENTIAL ANALYSIS
Automatic pickup of trajectory by method of sequential analysis taking into account deviation of radar markers from center of strobe N85-21535
SERIES EXPANSION
A convergent series expansion for hyperbolic systems of conservation laws [NASA-CR-172557] N85-21990
SERVICE LIFE
Tailored airfoils for vertical axis wind turbines [DE85-004628] N85-21128
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials [AD-A149701] N85-21406
Supported liquid membrane battery separators [DE85-001031] N85-21519
On maximizing the expected lifetime of replaceable systems [AD-A150003] N85-21680
SET THEORY
Maximum matchings in a class of random graphs [AD-A149663] N85-22060
SEYFERT GALAXIES
IRAS observations of Seyfert galaxies [NASA-CR-175557] N85-22267
SHADOWS
Numerical simulation of static and dynamic shadow patterns using an atomistic description of crack initiation and propagation [DE85-003226] N85-21715
SHALES
Workshop on Remote Sensing/Lineament Applications for Energy Extraction [DE84-009291] N85-21763
SHAPES
Semianalytic modeling of aerodynamic shapes [NASA-TP-2413] N85-21120
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel [AD-A149598] N85-22110
SHEAR FLOW
A three-dimensional spectral algorithm for simulations of transition and turbulence [NASA-CR-172561] N85-21575
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature [AD-A149657] N85-21580
SHEAR LAYERS
An investigation of compressible flows over open cavities including shear layer thickness effects [AD-A150086] N85-21588
SHEAR PROPERTIES
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984 [PB85-115426] N85-22103
SHELL THEORY
Vacancy-rearrangement theory in the first Magnus approximation [DE85-004435] N85-22123
SHELLS (STRUCTURAL FORMS)
A solution method for nonlinear dynamic analysis of shell structures [AD-A149646] N85-21708
Nonlinear analysis of layered composite plates and shells [PB85-127181] N85-21719
Geometrically nonlinear analysis of laminated elastic structures [NASA-CR-175609] N85-21720
SHIP HULLS
Remote self-contained undersea monitor [AD-D011520] N85-21599
SHIPS
A broadband kevlar radome for shipboard [AD-P004365] N85-21459
SHOCK LOADS
Evaluation of air and ground launched cruise missile navigational element containers [AD-A149654] N85-21138
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration [DE85-000467] N85-21618
Sound velocity of carbon at high pressures [DE85-002016] N85-22113
SHOCK TESTS
Evaluation of air and ground launched cruise missile navigational element containers [AD-A149654] N85-21138
SHOCK TUBES
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride [UTIAS-TN-253] N85-21577
SHOCK WAVE INTERACTION
The behaviour of detonation waves in single phase heterogeneous systems [AD-A149825] N85-21581
SHOCK WAVE PROPAGATION
Strong iron accelerating by collisionless magnnetosonic shock wave propagating perpendicular to a magnetic field [IPPJ-709] N85-22161
SHOCK WAVES
Wavecode constitutive models: Nonhomogeneous mixtures [DE85-000836] N85-21278
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride [UTIAS-TN-253] N85-21577
Front tracking and two dimensional Riemann problems: A conference report [DE85-002209] N85-21589
Biological effects of blast and impact waves [FOA-C-52006-H4-D7] N85-21968
Adaptive meshes in the 2DL code [LA-9938-MS] N85-22011
Recovering pointwise values of discontinuous data within spectral accuracy [NASA-CR-172535] N85-22049
Self-similar modified shock structures — cosmic rays N85-22290
SHORT CIRCUITS
Nickel-cadmium battery cell reversal from resistive network effects [AD-A149626] N85-21505
SHORT WAVE RADIO TRANSMISSION
Measurements and predictions of HF ground wave radio propagation over irregular, inhomogeneous terrain [PB85-110666] N85-21487
SHOULDERS
Shoulder and hip joint for hard space suits and the like [NASA-CASE-ARC-11543-1] N85-21986
SIDEBANDS
Wideband phase keyers N85-21544
SIDELOBES
Multiple loop sidelobe canceller [AD-D011533] N85-21434
Low sidelobe phased array antenna system [AD-D011558] N85-21435
SIGNAL DETECTION
Digital coherent detector [AD-D011560] N85-21501
Method and apparatus for detecting acoustic emissions from metal matrix wire [AD-D011556] N85-22107
SIGNAL DETECTORS
Detection of angular modulated electromagnetic signals [AD-D011563] N85-21437
Digital detector of harmonic signals N85-21549
Method and apparatus for detecting acoustic emissions from metal matrix wire [AD-D011556] N85-22107
SIGNAL ENCODING
Fundamental limits to synchronization and tracking [AD-A149623] N85-21504
SIGNAL FADING
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547
SIGNAL PROCESSING
Direction finder set, radio [AD-A149958] N85-21142
Detection of angular modulated electromagnetic signals [AD-D011563] N85-21437
Digital coherent detector [AD-D011560] N85-21501
Tubes and transistors in audio amplifiers N85-21532
Summator of radio pulse signals N85-21539
Synthesis of optimum receiver and processor for signal packet of radio pulses N85-21541
Multichannel digital processing of wideband signals N85-21548
Optimal discrete filtration of intricate phase-keyed signals N85-21550
Retinal information mapping system [AD-D011531] N85-21601
Application of homomorphic signal processing to stress wave factor analysis N85-21673
Seismic observation of infrasonic signals [AD-A149574] N85-21853
Electrical characterization of analog microprocessors [AD-A149629] N85-21995
Instrumentation award [AD-A150081] N85-21999
Topics in optical materials and device research, 3: Volume 1 [AD-A149726] N85-22145
Switchable zero order diffraction gratings as light valves [AD-A150129] N85-22153
The future of lightwave technology [PB85-109759] N85-22155
SIGNAL RECEPTION
Base communications issues for the 1980s [AD-A149764] N85-21474
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547
SIGNAL REFLECTION
Velocity inversion using a stratified reference [AD-A150082] N85-21858
SIGNAL TO NOISE RATIOS
Detection of angular modulated electromagnetic signals [AD-D011563] N85-21437
Fundamental limits to synchronization and tracking [AD-A149623] N85-21504
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547
SILANES
Process for producing tris s(n-methylamino) methylsilane [NASA-CASE-MFS-25721-1] N85-21280
SILICON
Preparation of crystal growth experiments in Spacelab: Si (FSLP), CdTe (D1), ZnS (D1) [BMFT-FB-W-84-045] N85-21227
Slip casting and nitridation of silicon powder [NASA-TM-77809] N85-21406
Improved silicon grinding method and apparatus [NASA-CASE-NPO-16336-1-CU] N85-21407
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability [AD-A150004] N85-21515
Crystallization methods for solar cell silicon N85-21774
Materials refining for solar cell silicon N85-21775
Flat-plate silicon for solar cells N85-21776
Silicon band spraying technique for solar cells N85-21778
Development of silicon nitride materials for the casting of solar cell silicon N85-21779
Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785
Investigation of the optical properties of solar elements N85-21786
Pin solar cells made of amorphous silicon N85-21787
Development of an amorphous silicon panel N85-21788
Amorphous silicon solar cells with a view to cheap production processes N85-21789
Plasmachemical evaporation and doping of amorphous silicon N85-21790
SILICON ALLOYS
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys [DE85-001285] N85-22193
SILICON CARBIDES
Parametric evaluation of ball milling of SiC in water [NASA-TM-86974] N85-21356
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride [NASA-TM-86945] N85-21674
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214

SILICON DIOXIDE
Fiber reinforced fused silica for hypersonic radome applications
[AD-P004366] N85-21460
SILICON FILMS
Ingot slicing machine and method
[NASA-CASE-NPO-15483-1] N85-21650
Technology of thin silicon foils for the fabrication of monolithic integrated sensors
[BMFT-FB-T-84-209] N85-22202
SILICON NITRIDES
Oxidation and hot corrosion of hot-pressed Si3N4 at 1000 deg C
[NASA-TM-86977] N85-21358
Pressureless sintered silicon nitride as a promising candidate for radome materials
[AD-P004367] N85-21461
Radiographic detectability limits for seeded voids in sintered silicon carbide and silicon nitride
[NASA-TM-86945] N85-21674
Development of silicon nitride materials for the casting of solar cell silicon N85-21779
Optimization of silicon-nitride-inversion layer solar cells N85-21784
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214
SILICONE RUBBER
Simple EOS for the silicone rubber Sylgard 184
[DE85-001394] N85-21376
SILVER
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver
[AD-A150109] N85-21294
SIMULATION
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
Estimating solar radiation for plant simulation models
[E85-10089] N85-21751
Recursive moment formulas for regenerative simulation
[AD-A150112] N85-22070
SIMULATORS
Drag-free satellite simulator
[REPT-615] N85-21229
SIMULTANEOUS EQUATIONS
Method and apparatus for self-calibration and phasing of array antenna
[NASA-CASE-NPO-15920-1] N85-21493
SINGLE CRYSTALS
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
Fracture toughness of materials
[DE85-004306] N85-21713
Total immersion crystal growth
[NASA-CASE-NPO-15800-2] N85-22178
SINGULAR INTEGRAL EQUATIONS
A note on the use of polynomial transformations in evaluating singular integrals
[MATHEMATICS-RESEARCH-165] N85-22053
SINGULARITY (MATHEMATICS)
On the accuracy of least squares methods in the presence of corner singularities
[NASA-CR-172552] N85-22050
SINTERING
Slip casting and nitridation of silicon powder
[NASA-TM-77609] N85-21406
Pressureless sintered silicon nitride as a promising candidate for radome materials
[AD-P004367] N85-21461
SITE SELECTION
Shallow magma targets in the western US
[DE85-003274] N85-21803
SIZE (DIMENSIONS)
Torso sizing ring construction for hard space suit
[NASA-CASE-ARC-11616-1] N85-21987
SIZE DETERMINATION
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system
[NASA-CR-174839] N85-21604
SIZE SEPARATION
Improved silicon grinding method and apparatus
[NASA-CASE-NPO-16336-1-CU] N85-21407
SKEWNESS
Compensation of skew passband of a SAW filter using predistortion N85-21422
SKIDDING
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108643] N85-21412
Skid steering of wheeled and tracked vehicles: Analysis with Coulomb friction assumptions
[AD-A149826] N85-21664
SKIN FRICTION
A two-axis, self-nulling skin friction balance
[NASA-CASE-LAR-13294-1] N85-21610
SKIN TEMPERATURE (BIOLOGY)
Circadian rhythm of human body temperature during spaceflights N85-21934
SKIRTS
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408
SKYLAB 4
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
SLABS
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples
[AERE-R-10549] N85-22173
SLEEVES
Windblast arm protector assembly
[AD-D011512] N85-21584
SLENDER WINGS
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423
SLIP CASTING
Slip casting and nitridation of silicon powder
[NASA-TM-77609] N85-21406
SLOPES
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
SMALL PERTURBATION FLOW
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
SMOKE
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297
Time and space variability of turbulent concentration fluctuations
[AD-A149963] N85-21898
SMOKE DETECTORS
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3874] N85-21675
SMOOTHING
Recovering pointwise values of discontinuous data within spectral accuracy
[NASA-CR-172535] N85-22049
SOBOLEV SPACE
On the accuracy of least squares methods in the presence of corner singularities
[NASA-CR-172552] N85-22050
SOCIOLOGY
An open-ended future: In defense of a new humanism
[NASA-TM-77613] N85-22209
SODIUM CHLORIDES
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
SOFTWARE ENGINEERING
AFOS (Automation of Field Operations and Service) surface observation decoding
[PB85-137586] N85-21913
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000
Earth radiation budget experiment software development
[NASA-CR-172567] N85-22002
DOS 21: PCDOS 2.0 support subroutine package for the IBM personal computer
[LA-10142-MS] N85-22012
Microcomputers in transit: A software handbook
[PB85-136414] N85-22042
A formal method for specifying computer resources in an implementation independent manner
[AD-A149955] N85-22043
SOIL MECHANICS
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
SOIL MOISTURE
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10062] N85-21747
SOIL SCIENCE
Glossary of the soil sciences
[PB85-133452] N85-22263
SOILS
Thematic Mapper spectral dimensionality and data structure N85-21736
Remote sensing research for agricultural applications — San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho
[E85-10090] N85-21752
Glossary of the soil sciences
[PB85-133452] N85-22263
SOLAR ACTIVITY
Plasma and nuclear processes in solar matter N85-22277
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data
[NASA-CR-175542] N85-22333
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980
[NASA-CR-175544] N85-22334
Solar-geophysical data number 483. November 1984. Part 1: (Prompt reports). Data for October 1984, September 1984 and late data
[PB85-147692] N85-22335
Solar-geophysical data number 483, November 1984. Part 2: (Comprehensive reports). Data for May 198, December 1981 and miscellanea
[PB85-147700] N85-22336
SOLAR ACTIVITY EFFECTS
The influence of the local solar wind structures on the propagation of low energy particles N85-22314
SOLAR ARRAYS
NASA welding assessment program
[NASA-CR-175512] N85-21661
Solar powered actuator with continuously variable auxiliary power control
[NASA-CASE-MFS-25637-1] N85-21769
User's manual for the University of Houston individual heliostat layout and performance code
[DE85-004643] N85-21808
SOLAR ATMOSPHERE
Plasma and nuclear processes in solar matter N85-22277
Equilibrium model of thin magnetic flux tubes — solar atmosphere N85-22310
SOLAR CELLS
GaAs and 3-5 compound solar cells status and prospects for use in space
[NASA-TM-86960] N85-21261
International Congress Centrum Berlin report on photovoltaics N85-21773
Crystallization methods for solar cell silicon N85-21774
Materials refining for solar cell silicon N85-21775
Flat-plate silicon for solar cells N85-21776
Carbothermic production of silicon solar cells using high-purity starting materials N85-21777
Silicon band spraying technique for solar cells N85-21778
Development of silicon nitride materials for the casting of solar cell silicon N85-21779
Photovoltaic solar components N85-21782
Optimization of silicon-nitride-inversion layer solar cells N85-21784
Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785
Investigation of the optical properties of solar elements N85-21786
Pin solar cells made of amorphous silicon N85-21787
Development of an amorphous silicon panel N85-21788
Amorphous silicon solar cells with a view to cheap production processes N85-21789
Production and characterization of amorphous silicon (a-Si:H) as base material for solar cells N85-21791
Thin-film solar cells from sputtered and vapor-deposited amorphous silicon N85-21792
Physical-chemical investigations of copper sulfides for use in CdS/Cu2S solar cells N85-21794
Development of high-efficiency economic systems for photovoltaics N85-21795
Development of a CdSe thin film solar cell N85-21796
Development of new solar cells N85-21797

SOLAR COLLECTORS
An investigation of aerowindows for solar receivers [DE84-010931] N85-21772
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller [DE84-010813] N85-21798
NBS solar collector durability/reliability test program [DE85-003489] N85-21801
Some solar dish/heat engine design considerations [DE85-003479] N85-21802
User's manual for the University of Houston individual heliostat layout and performance code [DE85-004643] N85-21808
Solar process heat: Technology program [BMFT-FB-T-84-234] N85-21812
Power from the Sun: Light at night [PB85-124097] N85-21814
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984) [DE85-004572] N85-21827
SOLAR CONSTANT
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system [E85-10094] N85-21756
SOLAR COOLING
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems [DE84-004521] N85-21770
SOLAR CORONA
Activation of solar flares N85-22276
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions [NASA-CR-175495] N85-22330
SOLAR CORPUSCULAR RADIATION
Plasma and nuclear processes in solar matter N85-22277
Solar-geophysical data number 483, November 1984. Part 2: (Comprehensive reports). Data for May 198, December 1981 and miscellanea [PB85-147700] N85-22336
SOLAR ECLIPSES
Rocket observations of the ionosphere during the eclipse of 26 February 1979 [NASA-CR-175513] N85-21850
SOLAR ENERGY
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems [DE84-004521] N85-21770
Large-size fine-granular graphite for solar techniques N85-21780
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller [DE84-010813] N85-21798
Latent heat storage technology and application workshop. Summary report: Session 6 [DE85-001097] N85-21806
Evaluation of ettringite and related compounds for use in solar energy storage [DE85-003249] N85-21809
Multi-year plan for Experimental Systems Research: Passive and hybrid solar energy program [DE85-004698] N85-21810
Phase change thermal energy storage and the model building codes [PB85-111201] N85-21813
Power from the Sun: Light at night [PB85-124097] N85-21814
Multiyear plan for experimental systems research passive and hybrid solar energy program [PB85-146868] N85-21815
Evaluation of ettringite and related compounds for use in solar energy storage [PB85-146876] N85-21816
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984) [DE85-004572] N85-21827
SOLAR ENERGY CONVERSION
Solar-assisted hydrogen generation by photoelectrocatalysis [PB85-149706] N85-21314
Solar energy converter using surface plasma waves [NASA-CASE-LEW-13827-1] N85-21768
Research on microemulsions for storage and conversion of solar energy [DE85-000181] N85-21807
SOLAR FLARES
Activation of solar flares N85-22276
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278
Forced recognition by nonlinear MHD waves and sequential triggering of solar flares N85-22291
Signatures of the coalescence instability in solar flares N85-22293
Solar-geophysical data. Part 2: (Comprehensive reports) [PB85-112076] N85-22332
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data [NASA-CR-175542] N85-22333
SOLAR FLUX DENSITY
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements [PB85-128148] N85-22265
SOLAR FURNACES
Preparation of crystal growth experiments in Spaceleb: Si (FSLP), CdTe (D1), ZnS (D1) [BMFT-FB-W-84-045] N85-21227
SOLAR GENERATORS
Development and prototype construction of photovoltaic energy supply units N85-21781
Photovoltaic solar components N85-21782
Testing and optimization of the production technology of large-surface Cu2S/CdS solar generators N85-21793
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984) [DE85-004572] N85-21827
SOLAR HEATING
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems [DE84-004521] N85-21770
Multiyear plan for experimental systems research passive and hybrid solar energy program [PB85-146868] N85-21815
SOLAR MAGNETIC FIELD
Magnetospheres in the solar system N85-22274
Activation of solar flares N85-22276
SOLAR MAXIMUM MISSION
Research and technology: Fiscal year 1984 report [NASA-TM-85231] N85-22340
SOLAR PONDS (HEAT STORAGE)
Direct-contact condensers for solar pond power production [DE84-004510] N85-21771
SOLAR PROMINENCES
Solar-geophysical data. Part 2: (Comprehensive reports) [PB85-112076] N85-22332
SOLAR RADIATION
Microprocessor-controlled rotating shadowband radiometer [DE85-003633] N85-21630
Estimating solar radiation for plant simulation models [E85-10089] N85-21751
Multi-year plan for Experimental Systems Research: Passive and hybrid solar energy program [DE85-004698] N85-21810
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980 [NASA-CR-175544] N85-22334
SOLAR RADIO BURSTS
Solar-geophysical data. Part 2: (Comprehensive reports) [PB85-112076] N85-22332
Solar-geophysical data number 483, November 1984. Part 2: (Comprehensive reports). Data for May 198, December 1981 and miscellanea [PB85-147700] N85-22336
SOLAR RADIO EMISSION
Preliminary investigation into using the sun as a source for G/T (Gain to System Noise Temperature) measurements [PB85-128148] N85-22265
A new radio emission at 3 kHz in the outer heliosphere N85-22312
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data [NASA-CR-175542] N85-22333
Solar-geophysical data number 483. November 1984. Part 1: (Prompt reports). Data for October 1984, September 1984 and late data [PB85-147692] N85-22335
SOLAR ROTATION
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980 [NASA-CR-175544] N85-22334
SOLAR SYSTEM
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271
Magnetospheres in the solar system N85-22274
SOLAR WIND
Discovery of the solar wind N85-22272
Velocity distributions of solar wind ions and electrons N85-22273
The influence of the local solar wind structures on the propagation of low energy particles N85-22314
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives [NASA-TM-77536] N85-22324
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-cometary and planetary studies [NASA-CR-175490] N85-22331
Solar-geophysical data number 483, November 1984. Part 2: (Comprehensive reports). Data for May 198, December 1981 and miscellanea [PB85-147700] N85-22336
SOLAR X-RAYS
Solar-geophysical data. Part 2: (Comprehensive reports) [PB85-112076] N85-22332
Solar-geophysical data number 483, November 1984. Part 2: (Comprehensive reports). Data for May 198, December 1981 and miscellanea [PB85-147700] N85-22336
SOLDERED JOINTS
NASA welding assessment program [NASA-CR-175512] N85-21661
SOLENOIDS
In-beam tests of an air-core superconducting-solenoid particle spectrometer [DE85-004029] N85-21625
SOLID ELECTROLYTES
Solid electrolytes: Mechanisms for achieving optimal conductivity [AD-A150116] N85-21296
SOLID PROPELLANT ROCKET ENGINES
Space Shuttle booster thrust imbalance analysis [NASA-TM-86493] N85-21241
Integrated insulation wall assembly --- for a solid rocket motor case [AD-D011553] N85-21257
Plasticizer system for propellant compositions [AD-D011502] N85-21390
Plasticizer system for propellant compositions [AD-D011508] N85-21391
Plasticizer system for propellant compositions [AD-D011516] N85-21394
Plasticizer system for propellant compositions [AD-D011517] N85-21395
SRM filament wound case resin characterization studies N85-22212
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
SOLID ROCKET BINDERS
Amine salts as bonding agents [AD-D011543] N85-21396
SOLID ROCKET PROPELLANTS
Azido nitramino ether containing solid propellants [AD-D011511] N85-21392
Plasticizer system for propellant compositions [AD-D011514] N85-21393
SOLID STATE DEVICES
Solar energy converter using surface plasma waves [NASA-CASE-LEW-13827-1] N85-21768
Semiconductor materials for high frequency solid state sources [AD-A150020] N85-22186
SOLID STATE LASERS
Advanced crystalline laser materials [DE85-003142] N85-21647
SOLIDIFICATION
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235
SOLIDS
Photoacoustic effect and its applications N85-21421
Moving nonlocal crack: Anti-plane shear case [AD-A149996] N85-21709
A study of the compatibility of an existing CFD package with a broader class of material constitutions N85-22219
SOLUBILITY
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles [DE85-004319] N85-21306
Alloy development, processing and characterization of devitrified titanium base microcrystalline alloys [AD-A149609] N85-21327
SOLUTIONS
Rheology of dissemination [AD-A150006] N85-21373

A method of calculating periodic solutions of second order dynamical systems [AD-A149634] N85-22058
SOLVENTS
Process for producing tris s(n-methylamino) methylsilane [NASA-CASE-MFS-25721-1] N85-21280
Electrochemistry and electrochemical methodology in molten salts [AD-A149613] N85-21284
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries [DE85-004345] N85-21525
SOOT
Ionic mechanisms of soot formation in flames [AD-A150119] N85-21297
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals [NASA-TM-83800] N85-22204
SOUND GENERATORS
Acoustic agglomeration methods and apparatus [NASA-CASE-NPO-15466-1] N85-22104
SOUND PROPAGATION
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida [AD-A149869] N85-22111
SOUND WAVES
Acoustic agglomeration methods and apparatus [NASA-CASE-NPO-15466-1] N85-22104
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel [AD-A149598] N85-22110
SOUNDING
Preliminary results of the oceanographic cruise of USCGC NORTHWIND to the Greenland Sea [AD-A149802] N85-21919
SOUNDING ROCKETS
Sounding rocket program Aeronomie. The payload M-I in the project MAP-WINE [BMFT-FB-W-84-046] N85-21238
SOUTHERN HEMISPHERE
A new NASA/MSFC mission analysis global cloud cover data base [NASA-TP-2448] N85-21878
SOYUZ SPACECRAFT
The space flight of the Soviet-Indian crew [NASA-TM-77615] N85-21226
SPACE CHARGE
Statistical phenomena in particle beams [DE85-001050] N85-22118
Simulation of space charge effects in particle accelerators [DE85-001828] N85-22120
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions [DE85-000887] N85-22192
SPACE COMMERCIALIZATION
Commercial space launches [S-REPT-98-656] N85-21225
SPACE COMMUNICATION
JPL highlights, 1983 [NASA-CR-175558] N85-22256
SPACE DEBRIS
Orbital Debris [NASA-CP-2360] N85-21188
NORAD operational system N85-21189
History of satellite break-ups in space N85-21190
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
Manmade orbital debris studies at NASA Langley N85-21192
NASA/JSC orbital debris study: Debris model N85-21193
Proposed preliminary design criteria model environment for the 1990's N85-21194
Assessment of satellite collision hazards by simulated sampling in space N85-21195
A model for the evolution of on-orbit manmade debris environment N85-21196
Geosynchronous satellite collision avoidance N85-21197
In situ orbital debris experiment concepts N85-21198
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
Use of ground radar to detect reentering debris N85-21200
Particle size, number, composition and velocity from solid rocket motors N85-21201
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Survey of probable micrometer-sized Earth-orbital debris fragments in the NASA-JSC cosmic dust sample collection N85-21203
Impacts on Explorer 46 from an Earth orbiting population N85-21204
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
Space debris protection for a reusable orbital transfer vehicle N85-21208
Parametric analysis: SOC meteoroid and debris protection N85-21209
Space heat rejection radiators: Meteoroid/debris consideration N85-21210
A remotely controlled orbiting retriever N85-21212
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
Orbital debris policy issues: Battelle involvement and some personal observations N85-21218
Considerations for policy on man-made debris propagation control N85-21219
Environment definition, large particles N85-21220
Modeling N85-21221
Measurements N85-21222
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Spacecraft hazard and shielding requirements N85-21224
Debris impact on Earth-orbiting spacecraft N85-22234
SPACE DENSITY
X-ray gauge measures areal density variations as small as 0.1% [DE85-003774] N85-21629
SPACE ERECTABLE STRUCTURES
Variable geometry truss concept [REPT-614] N85-21697
SPACE EXPLORATION
JPL highlights, 1983 [NASA-CR-175558] N85-22256
Planetary cartography in the next decade (1984 - 1994) [NASA-SP-475] N85-22323
SPACE FLIGHT
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
SPACE FLIGHT FEEDING
Self-charging metering and dispensing device for fluids [NASA-CASE-MSC-20275-1] N85-21595
SPACE HEATING (BUILDINGS)
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems [DE84-004521] N85-21770
SPACE MISSIONS
Results of Space Shuttle flight 41-D [GPO-39-481] N85-21243
SPACE NAVIGATION
JPL highlights, 1983 [NASA-CR-175558] N85-22256
SPACE OBSERVATIONS (FROM EARTH)
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
Use of ground radar to detect reentering debris N85-21200
SPACE PLATFORMS
Space Station [NASA-EP-211] N85-21251
SPACE POWER REACTORS
Irradiation effects on fuels for space reactors [DE84-016460] N85-22134
SPACE PROCESSING
Development of the sonic pump levitator [NASA-CR-171382] N85-21186
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187
SPACE RENDEZVOUS
Evaluation of OMV ranging and docking systems N85-22230
SPACE SHUTTLE BOOSTERS
Space Shuttle booster thrust imbalance analysis [NASA-TM-86493] N85-21241
SPACE SHUTTLE MAIN ENGINE
Using a data base management system for modelling SSME test history data N85-22211
An investigation of space shuttle main engine shutdown chugging instability N85-22221
Sensor control of robot arc welding N85-22233
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240
SPACE SHUTTLE MISSION 51-A
Atmospheric environment for Space Shuttle (STS-51A) launch [NASA-TM-86497] N85-21875
SPACE SHUTTLE ORBITERS
Results of Space Shuttle flight 41-D [GPO-39-481] N85-21243
SPACE SHUTTLE PAYLOADS
Monodisperse Latex Reactor (MLR): A materials processing space shuttle mid-deck payload [NASA-TM-86487] N85-21187
Satellite services and orbital retrieval N85-21211
Results of Space Shuttle flight 41-D [GPO-39-481] N85-21243
SPACE SHUTTLES
Aerospace Safety Advisory Panel [NASA-TM-87428] N85-21135
Space debris protection for a reusable orbital transfer vehicle N85-21208
Space heat rejection radiators: Meteoroid/debris consideration N85-21210
A remotely controlled orbiting retriever N85-21212
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base [RAD-84-203-001-80-21] N85-21230
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion [NASA-TM-86969] N85-21231
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive [NASA-CR-175565] N85-21242
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile [NASA-TM-85904] N85-21245
Space Shuttle interactive meteorological data system study [NASA-CR-171418] N85-21876
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program [NASA-CR-171317] N85-22210
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
SPACE STATIONS
Environment definition, small particles, diameter less than or equal to 1 MM N85-21223
Advanced research and technology programs for advanced high-pressure oxygen-hydrogen rocket propulsion [NASA-TM-86969] N85-21231
Space Station [NASA-EP-211] N85-21251
SPACE SUITS
Shoulder and hip joint for hard space suits and the like [NASA-CASE-ARC-11543-1] N85-21986
Torso sizing ring construction for hard space suit [NASA-CASE-ARC-11616-1] N85-21987
SPACE SURVEILLANCE (GROUND BASED)
NORAD operational system N85-21189
SPACE SURVEILLANCE (SPACEBORNE)
NORAD operational system N85-21189
SPACE TRANSPORTATION
Optimization of guidance and control using function minimization and NAVSTAR/GPS [AD-A149956] N85-21141
SPACE TRANSPORTATION SYSTEM
Space Shuttle interactive meteorological data system study [NASA-CR-171418] N85-21876
SPACE TRANSPORTATION SYSTEM FLIGHTS
STS atmospheric luminosities [NASA-CR-175514] N85-21240
Results of Space Shuttle flight 41-D [GPO-39-481] N85-21243
SPACE-TIME FUNCTIONS
Conserved quantities and radiative aspects of asymptotically anti-de Sitter space-times N85-22303
SPACEBORNE EXPERIMENTS
The space flight of the Soviet-Indian crew [NASA-TM-77615] N85-21226
SPACECRAFT COMMUNICATION
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
SPACECRAFT COMPONENTS
Environment definition, large particles N85-21220
NASA welding assessment program [NASA-CR-175512] N85-21661
SPACECRAFT CONFIGURATIONS
Modal control of structural systems [AD-A149734] N85-21235
SPACECRAFT CONTROL
Attitude data consistence check of rocket payloads [BMFT-FB-W-84-049] N85-21239

Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
Radioelectronics and space exploration N85-21533

SPACECRAFT DEFENSE
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21638

SPACECRAFT DESIGN
Space heat rejection radiators: Meteoroid/debris consideration N85-21210
Space Station
[NASA-EP-211] N85-21251
Design study of an integrated aerobraking orbital transfer vehicle
[NASA-TM-58264] N85-21262
Deployable folded antenna apparatus
[AD-D011503] N85-21495
Debris impact on Earth-orbiting spacecraft N85-22234

SPACECRAFT DOCKING
Evaluation of OMV ranging and docking systems N85-22230

SPACECRAFT ENVIRONMENTS
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 267, January 1985
[NASA-SP-7011(267)] N85-21959

SPACECRAFT EQUIPMENT
High-voltage, high-power, solid-state remote power controllers for aerospace applications
[NASA-TP-2437] N85-21263

SPACECRAFT INSTRUMENTS
In-situ detection of micron-sized dust particles in near-Earth space N85-21205

SPACECRAFT LAUNCHING
Atmospheric environment for Space Shuttle (STS-51A) launch
[NASA-TM-86497] N85-21875

SPACECRAFT MODULES
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250

SPACECRAFT ORBITS
Assessment of satellite collision hazards by simulated sampling in space N85-21195

SPACECRAFT POWER SUPPLIES
GaAs and 3-5 compound solar cells status and prospects for use in space
[NASA-TM-86960] N85-21261
General-purpose heat source developmet: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9660-SR] N85-22131

SPACECRAFT PROPULSION
Design study of an integrated aerobraking orbital transfer vehicle
[NASA-TM-58264] N85-21262

SPACECRAFT RADIATORS
Space heat rejection radiators: Meteoroid/debris consideration N85-21210

SPACECRAFT SHIELDING
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
Solid particle environment and protection for the Galileo Orbiter N85-21207
Space debris protection for a reusable orbital transfer vehicle N85-21208
Parametric analysis: SOC meteoroid and debris protection N85-21209
Spacecraft hazard and shielding requirements N85-21224

SPACECRAFT STRUCTURES
ACOSS 17 (Active Control of Space Structures)
[AD-A150007] N85-21253
Elastomer toughened polyimide adhesives — bonding metal and composite material structures for aircraft and spacecraft
[NASA-CASE-LAR-12775-2] N85-21349

SPARE PARTS
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21660

SPATIAL DISTRIBUTION
MTF analysis of LANDSAT-4 Thematic Mapper N85-21737
Technical support for creating an artificial intelligence system for feature extraction and experimental design
[NASA-CR-175286] N85-22044

SPATIAL FILTERING
Method of multivariant intraclass pattern recognition
[AD-D011546] N85-21405

SPATIAL RESOLUTION
Scan angle and detector effects in Thematic Mapper radiometry — Iowa and Arkansas N85-21735
The use of linear feature detection to investigate Thematic Mapper data performance and processing N85-21740
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266

SPECIFIC HEAT
Theoretical interpretation of thermal arrest data from differential thermal analysis measurements N85-22241

SPECIFICATIONS
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-80599] N85-21609
Requirements for a database management system
[DE85-004661] N85-22259

SPECTRA
Surface forward scattering and reflection
[AD-A150115] N85-22112

SPECTRAL BANDS
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
LANDSAT 4 band 6 data evaluation
[E85-10093] N85-21755
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications — Drum Mountains, Utah and Tonopath, Nevada
[E85-10095] N85-21757
Semiconductor materials for high frequency solid state sources
[AD-A150020] N85-22188

SPECTRAL ENERGY DISTRIBUTION
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119

SPECTRAL METHODS
Recovering pointwise values of discontinuous data within spectral accuracy
[NASA-CR-172535] N85-22049

SPECTRAL RESOLUTION
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
Thematic Mapper spectral dimensionality and data structure N35-21736
An analysis of the data obtained by a simultaneous observation of GMS and GMS-2: A study of the difference between the brightness temperatures by GMS and those by GMS-2 N85-21888

SPECTRAL SENSITIVITY
Investigation of the optical properties of solar elements N85-21786

SPECTRAL SIGNATURES
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10082] N85-21747
Remote sensing research for agricultural applications — San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho
[E85-10090] N85-21752

SPECTRAL THEORY
On a spectral theory of the excitation mechanism of galactic spirals N85-22284

SPECTROMETERS
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation
[DE85-001742] N85-21621
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627
High resolution diffraction grating
[AD-D011541] N85-22141

SPECTROSCOPIC ANALYSIS
Spectroscopic study of sources and control of impurities in TMX-U: Revision 1
[DE85-004423] N85-22170

SPECTRUM ANALYSIS
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra
[DE85-003259] N85-22114
Research in particles and fields
[NASA-CR-175472] N85-22337

SPECULAR REFLECTION
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
Surface forward scattering and reflection
[AD-A150115] N85-22112

SPEECH RECOGNITION
Automatic speech recognition in severe environments
[PB85-121697] N85-21490

SPEED CONTROL
Cost comparison of small gas turbines versus electric motors in a variable load industrial application
[PB85-149763] N85-21530

SPHERICAL WAVES
Comparison of spherical wave ray tracing and exact boundary value solutions for spherical radomes
[AD-P004353] N85-21447

SPHERULES
Survey of probable micrometer-sized Earth-orbital debris fragments in the NASA-JSC cosmic dust sample collection N85-21203

SPILLING
Methods/materials matrix of ultimate disposal techniques for spilled hazardous materials
[PB85-116853] N85-21833

SPIN GLASS
Microstructural and electronic characteristics of metallic spin glasses
[AD-A149959] N85-21371
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197

SPIN STABILIZATION
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225

SPIN-LATTICE RELAXATION
Proton NMR and susceptibility measurements in TiCoH/sub x
[DE85-003309] N85-21336

SPIN-SPIN COUPLING
Vacancy-rearrangement theory in the first Magnus approximation
[DE85-004435] N85-22123

SPINE
The clinical and radiological assessment of cervical injury, Annex A N85-21976

SPIRAL GALAXIES
On the morphology of spiral modes — disk galaxies N85-22283
On a spectral theory of the excitation mechanism of galactic spirals N85-22284
Drift-accretion theory of the spiral structure of galaxies N85-22298
Some constraints on magnetic fields in galactic spiral arms N85-22300

SPLINE FUNCTIONS
Scattered data interpolation using thin plate splines with tension
[AD-A149803] N85-21705
A two-dimensional smoothing spline and a regression problem
[AD-A149824] N85-22057

SPLITTING
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300

SPRAY CHARACTERISTICS
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122

SPRAY NOZZLES
An experimental study of spray thruster
[REPT-613] N85-21578

SPRAYED COATINGS
Low cost, sprayed CuInSe2 solar cell research
[DE85-003467] N85-21799

SPRAYERS
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system
[NASA-CR-174839] N85-21604

SPRAYING
Silicon band spraying technique for solar cells N85-21778

SPREAD SPECTRUM TRANSMISSION
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437
Spread spectrum mobile radio communications
[AD-A149936] N85-21477
SPRINGS (ELASTIC)
Pneumatic clamping device
[AD-D011544] N85-21656
SPUTTERING
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
SQUID (DETECTORS)
Ultrasensitive measuring devices
[DE85-000672] N85-21622
STABILITY
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21832
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
Suppression of tilting instability of a compact torus by energetic particle beams
[IPPJ-705] N85-22157
STABILIZATION
Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
STAINLESS STEELS
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel
[AERE-R-11034] N85-21315
Nondestructive testing of stainless steel to improve quality and output efficiency of the processing of ingot and continuous casting
[BMFT-FB-T-84-240] N85-21345
STANDARDIZATION
Update of thermal conductivity and electrical resistivity of electrolytic iron, tungsten and stainless steel
[PB85-115814] N85-21311
STANDARDS
Metrology for Electronic Technology: A bibliography of NBS (National Bureau of Standards)
[PB85-112895] N85-21486
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21832
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 2
[PB85-126043] N85-21836
Air quality criteria for ozone and other photochemical oxidants, external review draft, volume 3
[PB85-126050] N85-21837
Head/neck injury: Post mortem procedures, Annex B N85-21977
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115428] N85-22103
STAR CLUSTERS
Processes and problems in secondary star formation
[DE85-003623] N85-22322
STAR DISTRIBUTION
Discriminant analysis of pulsar groups in the diagram P versus P N85-22319
Processes and problems in secondary star formation
[DE85-003623] N85-22322
STARS
A survey of Mg II h and k emission in near-solar type stars
[NASA-CR-175572] N85-22269
STATIC LOADS
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21716
STATIC TESTS
Using a data base management system for modelling SSME test history data N85-22211
STATISTICAL ANALYSIS
General aviation activity and avionics survey
[AD-A149572] N85-21103
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 1: Correlation analysis of Marshall properties of laboratory-compacted specimens
[FAA/PM-84-12-VOL-1] N85-21180
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 2: Statistical analysis of Marshall properties of plant-produced bituminous materials
[FAA/PM-84-12-VOL-2] N85-21181
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 3: Statistical analysis of 3 methods for determining maximum specific gravity of bituminous concrete mixtures
[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 5: Summary of validation studies
[FAA/PM-84-12-VOL-5] N85-21184
Preliminary review of statistical treatment of S-glass/epoxy stress rupture data
[AD-A149610] N85-21275
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
General saddlepoint approximations with applications to l-statistics
[AD-A150073] N85-22086
Surface forward scattering and reflection
[AD-A150115] N85-22112
Statistical phenomena in particle beams
[DE85-001050] N85-22118
A statistical approach to vendor selection
[AD-A149781] N85-22249
STATISTICAL CORRELATION
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
STATISTICAL DECISION THEORY
A note on validity generalization procedures
[AD-A150065] N85-22085
STATISTICAL DISTRIBUTIONS
Tests of fit based on normalized spacings
[AD-A149749] N85-22082
General saddlepoint approximations with applications to l-statistics
[AD-A150073] N85-22086
Stable measures and processes in statistical physics
[AD-A149592] N85-22098
STATISTICAL MECHANICS
Stable measures and processes in statistical physics
[AD-A149592] N85-22098
STATISTICAL WEATHER FORECASTING
On the relationship between maximum surface temperature and various parameters; with reference to objective forecasting
[KNMI-TR-58] N85-21905
STEADY FLOW
The split-coefficient matrix method for supersonic three dimensional flow N85-21425
STEADY STATE CREEP
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694
STEAM
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
Steam generator tube vibration tests
[DE85-003599] N85-21712
Experimental study of steam condensation on water in countercurrent flow in presence of inert gases
[DE84-013028] N85-21800
STEELS
Ion-beam nitriding of steels
[NASA-CASE-LEW-14104-1] N85-21324
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers
[ARL-MAT-R-117] N85-21326
Characterization of lubricated bearing surfaces operated under high loads
[NASA-TM-86964] N85-21357
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409
STEERABLE ANTENNAS
An electronically-steerable active receiving array for h.f.
[BBC-RD-1985/2] N85-21430
STEERING
Skid steering of wheeled and tracked vehicles: Analysis with Coulomb friction assumptions
[AD-A149826] N85-21564
STELLAR EVOLUTION
The luminosity distribution of pulsars N85-22317
STELLAR LUMINOSITY
Dynamics of elliptical galaxies and the r sup 1/4 luminosity law N85-22282
The luminosity distribution of pulsars N85-22317
Formation of optical-line emitting regions in the jets of SS433 N85-22318
STELLAR MAGNETIC FIELDS
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231
The axisymmetric pulsar magnetosphere N85-22279
Nonlinear waves in the magnetosphere of pulsars N85-22281
Thermal convection and magnetic fields in accretion disks of black holes N85-22285
About static and dynamic solutions of the aligned rotator model — pulsar magnetospheres N85-22306
STELLAR MASS EJECTION
Mechanical energy release by protostars to molecular clouds N85-22302
STELLAR MODELS
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330
STELLAR RADIATION
A survey of Mg II h and k emission in near-solar type stars
[NASA-CR-175572] N85-22269
STELLAR SPECTRA
The ultraviolet excess of quasars 3: The highly polarized quasars PKS 0736+017 and PKS 1510-089
[NASA-CR-175576] N85-22266
A survey of Mg II h and k emission in near-solar type stars
[NASA-CR-175572] N85-22269
Plasma processes in Herbig-Haro objects N85-22301
Formation of optical-line emitting regions in the jets of SS433 N85-22318
STELLAR WINDS
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231
Plasma processes in Herbig-Haro objects N85-22301
An analytic model for hydromagnetospheres — stellar winds; pulsars; cosmic jets N85-22313
Processes and problems in secondary star formation
[DE85-003623] N85-22322
STIRLING CYCLE
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
Gas-fired duplex free-piston Stirling refrigerator N85-21413
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802
STOCHASTIC PROCESSES
Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116178] N85-21831
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline
[AD-A149957] N85-21857
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision
[AD-A149997] N85-22068
Rates of convergence of semistochastic approximation procedures for solving stochastic optimization problems N85-22088
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel
[AD-A149598] N85-22110
Statistical phenomena in particle beams
[DE85-001050] N85-22118
STORAGE RINGS (PARTICLE ACCELERATORS)
Review of polarized proton beam techniques and a report on the workshop on polarized beams
[DE85-004390] N85-22127
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154
Study of the potential usefulness of superfine holographic x-ray gratings in AXAF and astrophysics in general N85-22215
STORAGE STABILITY
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
STORMS
Hurricane alicia storm surge and wave data
[AD-A149668] N85-21896

STORMS (METEOROLOGY)
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
STRAIN GAGES
Thin film strain transducer — suitable for in-flight measurement of scientific balloon strain
[NASA-CASE-WLP-10055-2] N85-21598
Evaluation results of the 700 deg C Chinese strain gauges — for gas turbine engine
[NASA-TM-86973] N85-21605
MFTF sensor verification computer program
[DE85-004452] N85-22029
STRAIN MEASUREMENT
Thin film strain transducer — suitable for in-flight measurement of scientific balloon strain
[NASA-CASE-WLP-10055-2] N85-21598
STRATA
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
STRATIFICATION
Stratified charge rotary aircraft engine technology enablement program
[NASA-CR-174612] N85-21163
STRATOSPHERE
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 8
[NASA-CR-175564] N85-21849
STREAMS
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
STRESS (PHYSIOLOGY)
LBNP training of crew members on main missions aboard Salyut-6 orbital station N85-21938
Main component method used to study variations of cardiovascular parameters N85-21939
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944
STRESS (PSYCHOLOGY)
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985
STRESS ANALYSIS
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
3-D inelastic analysis methods for hot section components (base program) — turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
Scattered data interpolation using thin plate splines with tension
[AD-A149803] N85-21705
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves
[AERE-R11483] N85-22203
A study of the compatibility of an existing CFD package with a broader class of material constitutions N85-22219
STRESS CONCENTRATION
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution
[NASA-TM-86913] N85-21690
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-400] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-406] N85-21701
Moving nonlocal crack: Anti-plane shear case
[AD-A149998] N85-21709
Fracture analysis of cracks in complete cylindrical shells
[AD-A150091] N85-21711
Reliability of structural brittle materials N85-22222
STRESS CORROSION CRACKING
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
Stress corrosion cracking behavior of tungsten heavy alloys
[AD-A149843] N85-21329
STRESS FUNCTIONS
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
STRESS INTENSITY FACTORS
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21698
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-408] N85-21699
STRESS MEASUREMENT
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
STRESS RELAXATION
Rheology of dissemination
[AD-A150006] N85-21373
STRESS RELIEVING
Stress-relieving interlayers for bituminous resurfacings
[PB85-136885] N85-21415
STRESS WAVES
Application of homomorphic signal processing to stress wave factor analysis N85-21673
STRESS-STRAIN RELATIONSHIPS
A solution method for nonlinear dynamic analysis of shell structures
[AD-A149846] N85-21708
A study of the compatibility of an existing CFD package with a broader class of material constitutions N85-22219
STRUCTURAL ANALYSIS
Alternative approximation concepts for space frame synthesis
[NASA-CR-172526] N85-21150
Nonlinear analysis for high-temperature multilayered fiber composite structures — turbine blades
[NASA-TM-83754] N85-21273
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
3-D inelastic analysis methods for hot section components (base program) — turbine blades, turbine vanes, and combustor liners
[NASA-CR-174700] N85-21686
On local total strain redistribution using a simplified cyclic inelastic analysis based on an elastic solution
[NASA-TM-86913] N85-21690
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
A solution method for large deformation contact problems
[AD-A149842] N85-21707
A solution method for nonlinear dynamic analysis of shell structures
[AD-A149846] N85-21708
Geometrically nonlinear analysis of laminated elastic structures
[NASA-CR-175609] N85-21720
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22089
STRUCTURAL DESIGN CRITERIA
Image lobe analysis for large radomes
[AD-P004359] N85-21453
Broadband thermoplastic radomes
[AD-P004369] N85-21463
STRUCTURAL ENGINEERING
Proceedings of the 9th Biennial Army Symposium on Solid Mechanics. Advances in Solid Mechanics for Design and Analysis
[AD-A150042] N85-21710
Computer-Aided Structural Engineering (CASE) project. Seepage analysis of confined flow problems by the method of fragments (CFRAG)
[AD-A150015] N85-21762
STRUCTURAL MEMBERS
Viscoplastic constitutive relationships with dependence on thermomechanical history
[NASA-CR-174836] N85-21691
STRUCTURAL PROPERTIES (GEOLOGY)
Workshop on Remote Sensing/Lineament Applications for Energy Extraction
[DE84-009291] N85-21763
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326
STRUCTURAL RELIABILITY
Axiomatic characterizations of continuum structure functions
[AD-A149617] N85-21706
STRUCTURAL STABILITY
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
STRUCTURAL VIBRATION
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693
STUDENTS
Satellite communications and amateur radio N85-21534
SUBMARINES
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
The body burden of organic vapors in artificial air trial measurements aboard a moored submarine
[AD-A149698] N85-21988
SUBROUTINE LIBRARIES (COMPUTERS)
ZTL: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 IEEE-488 controller
[LA-10141-MS] N85-22010
TRANIO: A subroutine package for the IBM personal computer to support the transfer 6002 CAMAC crate controller
[LA-10145-MS] N85-22015
A proposal for standard basic functions in Ada
[CWI-NM-R8407] N85-22036
SUBROUTINES
DOS 21: PCDOS 2.0 support subroutine package for the IBM personal computer
[LA-10142-MS] N85-22012
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013
ZTLCK: A subroutine package for the IBM personal computer to support the Ziatech ZT1488 real time clock
[LA-10146-MS] N85-22014
Programs for dynamic loading of precompiled subroutine packages, especially for applications with the Watfiv compiler
[DFVLR-MITT-84-18] N85-22035
SUBSTITUTES
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346
SUBSTRATES
Low temperature deposition of nickel films
[AD-D011568] N85-21319
A process to produce fine line metallic collection patterns on semiconductors devices
[NASA-CASE-NPO-16413-1] N85-21325
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates
[FOA-C-30383-E] N85-21527
SUDDEN IONOSPHERIC DISTURBANCES
Solar-geophysical data number 483. November 1984. Part 1: (Prompt reports). Data for October 1984, September 1984 and late data
[PB85-147692] N85-22335
SUDDEN STORM COMMENCEMENTS
Solar-geophysical data number 479, July 1984. Part 1: (Prompt reports). Data for June 1984, May 1984 and later data
[NASA-CR-175542] N85-22333
SULFATES
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
SULFONES
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries
[DE85-004345] N85-21525
SULFUR DIOXIDES
Evaluation of complex terrain air quality simulation models
[PB85-119485] N85-21835
SULFUR FLUORIDES
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577
SUMMER
Sector analysis of relevant meteorological parameters for long range transport of air pollutants
[NR-27] N85-21882

Collection and use of lightning strike data in the western US during summer 1983
[PB85-110534] N85-21907
SUN
Plasma and nuclear processes in solar matter N85-22277
SUPERCONDUCTING MAGNETS
In-beam tests of an air-core superconducting-solenoid particle spectrometer
[DE85-004029] N85-21625
Superconducting magnet technology for accelerators
[DE85-004192] N85-22102
SUPERCONDUCTIVITY
Metrology for Electronic Technology: A bibliography of NBS (National Bureau of Standards)
[PB85-112895] N85-21486
Rotating squid magnetometers and gradiometers
[AD-D011529] N85-21600
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195
SUPERCONDUCTORS
Thin film technology of high-critical-temperature superconducting electronics
[AD-A150010] N85-22185
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194
SUPERCRITICAL FLOW
Nested subcritical flows within supercritical systems
[NASA-TM-86980] N85-21574
SUPERCRITICAL WINGS
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
Unsteady transonic pressure measurements on a semi-span wind-tunnel model of a transport-type supercritical wing (Lann model). Part 2: Pressure distributions (plotted) and plots of the vibration modes
[AD-A130488] N85-21579
SUPERFLUIDITY
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
SUPERHETERODYNE RECEIVERS
High-frequency input device for superheterodyne radio receiver with wideband preselector N85-21540
SUPERLATTICES
Evaluation of implantation-disordering of (InGa)As/GaAs strained-layer superlattices
[DE85-003533] N85-22200
SUPERNOVAE
Processes and problems in secondary star formation
[DE85-003623] N85-22322
SUPERSONIC AIRCRAFT
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175
SUPERSONIC FLOW
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
The split-coefficient matrix method for supersonic three dimensional flow N85-21425
SUPERSONIC SPEEDS
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454
SURFACE ACOUSTIC WAVE DEVICES
Compensation of skew passband of a SAW filter using predistortion N85-21422
Improvement of VHF(MB) model
[AD-A150087] N85-21480
SAW oscillator with digital compensation for the temperature related frequency changes
[AD-D011537] N85-21500
Monolithic thin film SAW (Surface Acoustic Wave) structures
[AD-A149782] N85-21511
SURFACE ENERGY
Measurements of the surface energy budget in the southern Gobi Desert of China, and in the Rocky Mountains of Colorado
[NASA-CR-175506] N85-21847
SURFACE FINISHING
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267
Ion-beam nitriding of steels
[NASA-CASE-LEW-14104-1] N85-21324
A process to produce fine line metallic collection patterns on semiconductors devices
[NASA-CASE-NPO-16413-1] N85-21325
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology
[BMFT-FB-T-84-236] N85-21672
SURFACE GEOMETRY
Semianalytic modeling of aerodynamic shapes
[NASA-TP-2413] N85-21120
A deformation analysis of flat flexible gear and its equation of original curved surfaces
[NASA-TM-77493] N85-21660
SURFACE IONIZATION
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
SURFACE LAYERS
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver
[AD-A150109] N85-21294
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
SURFACE PROPERTIES
Runway rubber removal specification development field evaluation procedures development
[FAA-PM-84-27] N85-21179
Solar-assisted hydrogen generation by photoelectrocatalysis
[PB85-149706] N85-21314
Tribological properties of boron nitride synthesized by ion beam deposition
[NASA-TM-86962] N85-21355
Evaluation of corrosion-erosion behavior of various ceramic materials
[AD-A149756] N85-21367
Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693
SURFACE REACTIONS
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293
SURFACE ROUGHNESS
Wind-tunnel research on the mechanics of plumes in the atmospheric surface layer
[AD-A150019] N85-21584
Electromagnetic Acoustic Transducers (EMATs) for erosion monitoring
[DE85-004834] N85-21628
Surface forward scattering and reflection
[AD-A150115] N85-22112
SURFACE TEMPERATURE
Hot radome boresight error measurements
[AD-P004364] N85-21458
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline
[AD-A149957] N85-21857
Oceanic role in terrestrial climate
[DE85-004422] N85-21904
On the relationship between maximum surface temperature and various parameters; with reference to objective forecasting
[KNMI-TR-58] N85-21905
SURFACE WATER
Isolation, concentration and subsequent analysis by capillary gas chromatography of trace amounts of organophosphorus compounds from aqueous samples
[AD-B089301L] N85-21308
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
SURFACE WAVES
The effects of surface waves on RF discharge pumped lasers
[AD-A149889] N85-21643
Solar energy converter using surface plasma waves
[NASA-CASE-LEW-13827-1] N85-21768
SURFACTANTS
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles
[DE85-004319] N85-21306
SURGES
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3678] N85-21117
Hurricane storm surge research
[GPO-40-048] N85-21880
Hurricane silcia storm surge and wave data
[AD-A149668] N85-21896
SURVEILLANCE RADAR
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar
[AD-D011561] N85-21436
SURVEYS
General aviation activity and avionics survey
[AD-A149572] N85-21103
SURVIVAL
Proportional odds models for survival data and estimates using ranks
[MATHEMATICS-RESEARCH-172] N85-22080
SUSPENDING (HANGING)
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
SWEAT COOLING
Advanced liner-cooling techniques for gas turbine combustors
[NASA-TM-86952] N85-21115
SWITCHES
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
SWITCHING CIRCUITS
Power circuit utilizing self-excited Hall effect switch means
[AD-D011505] N85-21496
SYMMETRY
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160
SYNCHRONOUS SATELLITES
Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications
[AD-A150097] N85-21900
SYNCHROTRON RADIATION
Betatron-synchrotron detrapping in a tapered wiggler free electron laser
[AD-A149686] N85-21642
Resonance between betatron and synchrotron oscillations in a free electron laser: A 3-D numerical study
[AD-A150059] N85-21645
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183
SYNOPTIC METEOROLOGY
Oceanographic and meteorological research based on the data products of SEASAT
[E85-10091] N85-21753
AFOS (Automation of Field Operations and Service) surface observation decoding
[PB85-137586] N85-21913
SYNTAX
An algorithm for generating abstract syntax trees
[NASA-CR-172541] N85-22003
The four forms of omega
[AD-A149694] N85-22020
SYNTHESIS (CHEMISTRY)
The synthesis, structural characterization and reactions of closo-Rhodacarborane Anions containing a formal d8 metal vertex 1,2
[AD-A149640] N85-21285
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes
[NASA-CASE-ARC-11512-2] N85-21362
Fire-resistant phosphorus containing compounds, polyimides and copolyimides
[NASA-CASE-ARC-11522-2] N85-21363
Scale-up of vanadium trineodecanoate
[AD-A149935] N85-21370
Plasticizer system for propellant compositions
[AD-D011502] N85-21390
Plasticizer system for propellant compositions
[AD-D011508] N85-21391
Plasticizer system for propellant compositions
[AD-D011517] N85-21395
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals
[NASA-TM-83800] N85-22204
SYNTHETIC APERTURE RADAR
The imaging of internal waves by the SEASAT-A synthetic aperture radar
[AD-A149808] N85-21761
SYSTEM EFFECTIVENESS
A computer-based gaming system for assessing recognition performance (RECOG)
[AD-A149752] N85-22022

SYSTEM IDENTIFICATION
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967
SYSTEMS ANALYSIS
Reliability analysis of automatic systems
[VTT-301] N85-21682
Needs, opportunities, and options for large scale systems research
[DE85-004642] N85-22091
SYSTEMS COMPATIBILITY
Software for special functions
[DE85-004684] N85-22033
SYSTEMS ENGINEERING
Integrated control system engineering support
[AD-A149742] N85-21177
China report: Science and technology
[JPRS-CST-85-008] N85-21416
Systems research on China in year 2000 N85-21416
Needs, opportunities, and options for large scale systems research
[DE85-004642] N85-22091
SYSTEMS INTEGRATION
A safety evaluation of the relocation of the ACM (Air Combat Maneuver) panel in the F-14 ( )/AIP (Avionics Integration Program)
[AD-A149596] N85-21158
Dual band radome wall design
[AD-P004357] N85-21451
SYSTEMS MANAGEMENT
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248

T

T TAURI STARS
Mechanical energy release by protostars to molecular clouds N85-22302
TACTICS
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454
TANTALUM
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
TAPE RECORDERS
Operating time meter for tape recorder N85-21537
TARGET ACQUISITION
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
TARGET RECOGNITION
Automatic pickup of trajectory by method of sequential analysis taking into account deviation of radar markers from center of strobe N85-21535
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
The accuracy in calculations of intervisibility with digital terrain models — digital models
[FOA-C-20557-D8(E1)] N85-21983
TARGETS
Nose and inlet duct radomes for the firebolt aerial target
[AD-P004375] N85-21469
Experimental test of the three subaperture method for estimating target elevation angle
[AD-A149687] N85-21614
Shallow magma targets in the western US
[DE85-003274] N85-21803
TAXONOMY
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926
TEAMS
Team dimensions: Their identity, their measurement and their relationships
[AD-A149662] N85-21978
TEARING MODES (PLASMAS)
Forced recognition by nonlinear MHD waves and sequential triggering of solar flares N85-22291
TECHNOLOGICAL FORECASTING
Technological and economic assessment of advanced ceramic materials. Volume 1: Summary and conclusions
[PB85-113082] N85-21383
Technological and economic assessment of advanced ceramic materials. Volume 6: A case study of ceramic cutting tools
[PB85-113132] N85-21387
TECHNOLOGIES
China report: Science and technology
[JPRS-CST-85-008] N85-21416
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
An open-ended future: In defense of a new humanism
[NASA-TM-77613] N85-22209
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
TECHNOLOGY ASSESSMENT
Technological and economic assessment of advanced ceramic materials. Volume 2: A case study of ceramics in heat engine applications
[PB85-113090] N85-21384
Technological and economic assessment of advanced ceramic materials. Volume 5: A case study of ceramic toxic and combustible gas sensors
[PB85-113124] N85-21386
High-technology ceramics in Japan
[PB85-125029] N85-21389
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806
Multiyear plan for experimental systems research passive and hybrid solar energy program
[PB85-146868] N85-21815
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy
[GPO-41-060] N85-22244
TECHNOLOGY TRANSFER
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
Transfer of technology
[S-REPT-98-664] N85-22246
Transfer of technology
[S-HRG-98-986] N85-22247
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254
Technology transfer to the Middle East
[PB85-127744] N85-22264
TECHNOLOGY UTILIZATION
Technological and economic assessment of advanced ceramic materials: Volume 4: A case study of integrated optic devices
[PB85-113116] N85-21385
Applications of Tethers in Space
[NASA-CP-2366] N85-21659
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology
[BMFT-FB-T-84-236] N85-21672
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806
TELECOMMUNICATION
Base communications issues for the 1980s
[AD-A149764] N85-21474
Digital channel efficiency model
[AD-A150084] N85-21479
Sample size and precision in communication performance measurements
[PB85-1143270] N85-21488
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
Computer and communications security and privacy
[GPO-39-741] N85-21994
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
Technology transfer to the Middle East
[PB85-127744] N85-22264
TELEMETRY
Wind-weighting for sounding rockets with a telemetry system
[NASA-TP-2438] N85-21246
TELEVISION CAMERAS
Television camera video level control system
[NASA-CASE-MSC-18578-1] N85-21427
TELEVISION EQUIPMENT
Device for controlling operation of lithicon cathode-ray memory tube N85-21542
TELEVISION SYSTEMS
Estimation of the impulse response of television channels from digitized waveforms
[CRC-1376] N85-21429
Television animation store: Digital chroma, key and mixer units
[BBC-RD-1984/16] N85-21442
TELEVISION TRANSMISSION
Brussels Satellite Convention
[S-EXEC-REPT-98-52] N85-21234
Estimation of the impulse response of television channels from digitized waveforms
[CRC-1376] N85-21429
TEMPERATURE
Temperature responses of composite panels
[AD-A150053] N85-21277
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
TEMPERATURE CONTROL
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636
High temperature acoustic levitator
[NASA-CASE-NPO-16022-1] N85-22105
TEMPERATURE DEPENDENCE
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195
TEMPERATURE DISTRIBUTION
Mathematical simulation of thermal prrocesses involved in electron-beam treatment N85-21565
TEMPERATURE EFFECTS
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles
[DE85-004319] N85-21306
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001823] N85-21626
Evaluation of ettringite and related compounds for use in solar energy storage
[PB85-146876] N85-21816
Preventive effect of acute heat factors during hypokinesia N85-21945
TEMPERATURE GRADIENTS
Heat flux in Lorentzian plasma
[IPPJ-704] N85-22158
TEMPERATURE MEASUREMENT
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297
Method of and apparatus for measuring temperature and pressure --- atmospheric sounding
[NASA-CASE-GSC-12558-1] N85-21639
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723
TEMPERATURE PROBES
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
TEMPERATURE PROFILES
Analysis of selective chopper radiometer data
[NASA-CR-175157] N85-21894
TEMPORAL RESOLUTION
Fast times at high temperatures
[DE85-003306] N85-22205
TENSILE PROPERTIES
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409
TENSILE STRENGTH
Effects of chromium and aluminum on mechanical and oxidation properties of iron-nickel-base superalloys based on CG-27
[NASA-TP-2443] N85-21323
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224
TERMINAL BALLISTICS
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
TERNARY SYSTEMS
Characterization of high temperature electrically conducting oxides
[DE85-004296] N85-21307
Process for making a heterojunction source-drain insulated gate field-effect transistors utilizing diffusion to form the lattice
[AD-D011536] N85-22176
TERRAIN ANALYSIS
The accuracy in calculations of intervisibility with digital terrain models --- digital models
[FOA-C-20557-D8(E1)] N85-21983
TERRESTRIAL PLANETS
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-cometary and planetary studies
[NASA-CR-175490] N85-22331

TEST FACILITIES
A history of full-scale testing of aircraft structures at the National Aeronautical Establishment [NAE-AN-24] N85-21153
Heat Cycle Research Experimental Program report, FY-84 [DE85-003558] N85-21811
TEST FIRING
Using a data base management system for modelling SSME test history data N85-22211
TEST VEHICLES
A functional vehicle for autonomous mobile robot research [AD-A150052] N85-21666
TETHERED SATELLITES
Applications of Tethers in Space [NASA-CP-2386] N85-21659
TETHERING
A functional vehicle for autonomous mobile robot research [AD-A150052] N85-21666
TETHERLINES
Applications of Tethers in Space [NASA-CP-2386] N85-21659
THEMATIC MAPPING
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM) [E85-10069] N85-21724
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
A preliminary assessment of LANDSAT-4 Thematic Mapper data — Windsor, Ontario and Medicine Hat areas, Canada N85-21728
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729
A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744
Investigation of TM band-to-band registration using the JSC registration processor N85-21745
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data [E85-10082] N85-21747
Remote sensing research for agricultural applications — San Joaquin County, California and Snake River Plain and Twin Falls area, Idaho [E85-10090] N85-21752
LANDSAT 4 band 6 data evaluation [E85-10093] N85-21755
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system [E85-10094] N85-21756
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications — Drum Mountains, Utah and Tonopath, Nevada [E85-10095] N85-21757
Review of computer mapping and display techniques applicable to regional analysis [DE85-003545] N85-21764
THEORETICAL PHYSICS
Theoretical nuclear physics [DE85-003466] N85-22135
Research in theoretical physics [DE85-004286] N85-22207
THERMAL ANALYSIS
Theoretical interpretation of thermal arrest data from differential thermal analysis measurements N85-22241
THERMAL CONDUCTIVITY
Temperature responses of composite panels [AD-A150053] N85-21277
Update of thermal conductivity and electrical resistivity of electrolytic iron, tungsten and stainless steel [PB85-115814] N85-21311
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
THERMAL CYCLING TESTS
NASA welding assessment program [NASA-CR-175512] N85-21661
THERMAL DECOMPOSITION
Synthesis, static and reactive characterization of supported organometallics [DE85-004285] N85-21340
The use of hydrazine as an alternate source of energy [NASA-CR-175535] N85-21397
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
THERMAL EMISSION
Continuous laminar smoke generator [NASA-CASE-LAR-13014-1] N85-21178
THERMAL INSULATION
Integrated insulation wall assembly — for a solid rocket motor case [AD-D011553] N85-21257
THERMAL MAPPING
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures — Illinois N85-21731
THERMAL PROTECTION
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive [NASA-CR-175565] N85-21242
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile [NASA-TM-85904] N85-21245
Process for preparing highly optically transparent-colorless aromatic polyimide film [NASA-CASE-LAR-13351-1] N85-21360
THERMAL RESISTANCE
Thermal barrier coating system [NASA-CASE-LEW-13324-2] N85-21266
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes [NASA-CASE-ARC-11512-2] N85-21362
Fire and heat resistant laminating resins based on maleimido and citraconimido substituted 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diaminobenzenes [NASA-CASE-ARC-11533-1] N85-21364
Temperature-insensitive optical fibers [AD-D011551] N85-22142
THERMAL STABILITY
Fire-resistant phosphorus containing compounds, polyimides and copolyimides [NASA-CASE-ARC-11522-2] N85-21363
High-temperature-stable detonators [DE85-005188] N85-21402
SAW oscillator with digital compensation for the temperature related frequency changes [AD-D011537] N85-21500
THERMAL STRESSES
Temperature responses of composite panels [AD-A150053] N85-21277
Stress compensation crystal device [AD-D011497] N85-22189
THERMALIZATION (ENERGY ABSORPTION)
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field [IPPJ-707] N85-22160
THERMOCHEMICAL PROPERTIES
Compiled and thermodynamic data sources for aqueous and biochemical systems: An annotated bibliography, 1930 - 1983 [PB85-137693] N85-22208
THERMOCLINES
The effect of stochastic surface heat fluxes on the climatology of the seasonal thermocline [AD-A149957] N85-21857
THERMOCOUPLES
Advanced thin film thermocouples [NASA-CR-175541] N85-21607
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C [DE85-000810] N85-21624
THERMODYNAMIC CYCLES
Heat Cycle Research Experimental Program report, FY-84 [DE85-003558] N85-21811
THERMODYNAMIC EQUILIBRIUM
Nucleation of phase transitions in the vicinity of phase boundary. Part 1: Comparison of various idolated mechanisms. Part 2: Coupled cluster growth processes [N-0208-5658] N85-22174
Compiled and thermodynamic data sources for aqueous and biochemical systems: An annotated bibliography, 1930 - 1983 [PB85-137693] N85-22208
THERMODYNAMIC PROPERTIES
Novel photo-thermal technique for flow and spectroscopic measurements in a dense aerosol stream [AD-A149745] N85-21287
Chemical approach for controlling nadimide cure temperature and rate [NASA-CASE-LEW-13770-5] N85-21352
Fine-grained, isotropic graphite for use as NBS (National Bureau of Standards) thermophysical property RM's from 5 to 2500 K [PB85-112886] N85-21381
Mathematical simulation of thermal prrocesses involved in electron-beam treatment N85-21565
Normal coordinate monolithic crystal filter [AD-D011496] N85-22188
Ideal gas thermodynamic properties for the phenyl, phenoxy, and o-biphenyl radicals [NASA-TM-83800] N85-22204
Green's function solution of the Kondo problems and universality of the thermodynamic properties [DE85-002739] N85-22206
THERMODYNAMICS
Viscoplastic constitutive relationships with dependence on thermomechanical history [NASA-CR-174836] N85-21691
Atmospheric environment for Space Shuttle (STS-51A) launch [NASA-TM-86497] N85-21875
THERMOELASTICITY
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity [NASA-CR-174872] N85-21685
THERMOELECTRIC GENERATORS
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 4 [LA-10217-SR] N85-22128
THERMOELECTRIC POWER GENERATION
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5 [LA-10232-SR] N85-22129
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1 [LA-9680-SR] N85-22131
THERMOGRAPHY
Fast times at high temperatures [DE85-003306] N85-22205
THERMOMETERS
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
THERMOPHYSICAL PROPERTIES
Fine-grained, isotropic graphite for use as NBS (National Bureau of Standards) thermophysical property RM's from 5 to 2500 K [PB85-112886] N85-21381
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Nested subcritical flows within supercritical systems [NASA-TM-86960] N85-21574
Thermophysical properties of working fluids for binary geothermal cycles [DE85-000385] N85-21804
THERMOPLASTIC RESINS
Broadband thermoplastic radomes [AD-P004369] N85-21463
THERMOSPHERE
High time resolution thermospheric temperature and wind studies in the Arctic [AD-A150114] N85-21860
Experiment for measuring electric fields within the sounding rocket project Energy Budget [BMFT-FB-W-84-048] N85-21866
Models of the upper atmosphere N85-22217
THICKNESS
An investigation of compressible flows over open cavities including shear layer thickness effects [AD-A150066] N85-21588
THIN FILMS
A computer simulation of thin film nucleation and growth: The Volmer-Weber case [NASA-TM-86968] N85-21264
A process to produce fine line metallic collection patterns on semiconductors devices [NASA-CASE-NPO-16413-1] N85-21325
Monolithic thin film SAW (Surface Acoustic Wave) structures [AD-A149782] N85-21511
Advanced thin film thermocouples [NASA-CR-175541] N85-21607
Ultrasensitive measuring devices [DE85-000672] N85-21622
Development of a CdSe thin film solar cell N85-21796
Thin film technology of high-critical-temperature superconducting electronics [AD-A150010] N85-22185
THIN PLATES
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings [AD-A149748] N85-21704
Scattered data interpolation using thin plate splines with tension [AD-A149803] N85-21705
THIN WALLED SHELLS
A new NDE (Non-Destructive Evaluation) capability for thin-shelled structures [AD-A149625] N85-21678

THREAT EVALUATION
Dual band radome wall design
[AD-P004357] N85-21451
THREE DIMENSIONAL BODIES
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
THREE DIMENSIONAL FLOW
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
The split-coefficient matrix method for supersonic three dimensional flow N85-21425
A three-dimensional spectral algorithm for simulations of transition and turbulence
[NASA-CR-172561] N85-21575
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149651] N85-21582
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150080] N85-21587
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
THRESHOLDS
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547
THRUST DISTRIBUTION
Space Shuttle booster thrust imbalance analysis
[NASA-TM-86493] N85-21241
THRUST MEASUREMENT
Vacuum chamber pressure effects on thrust measurements of low Reynolds number nozzles
[NASA-TM-86955] N85-21259
THUNDERSTORMS
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982
[NASA-TM-86347] N85-21677
THYRISTORS
High-voltage, high-power, solid-state remote power controllers for aerospace applications
[NASA-TP-2437] N85-21263
New types of power supplies for ultrasonic processing equipment N85-21566
TILES
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive
[NASA-CR-175565] N85-21242
Photovoltaic roofing tile systems N85-21783
TIME
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860
Annals of the New York Academy of Sciences, Volume 423 — timing and time perception
[AD-A150031] N85-21981
TIME DEPENDENCE
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302
Rheology of dissemination
[AD-A150006] N85-21373
Surface forward scattering and reflection
[AD-A150115] N85-22112
TIME DIVISION MULTIPLE ACCESS
Multimission advanced configurations study — telecommunication satellites
[MATRA-DM.51/CC/FL/0151.83] N85-21237
TIME LAG
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
TIME MARCHING
Time marching numerical solution of the dynamic response of nonlinear systems
[NAF-AN-25] N85-21696
TIME MEASUREMENT
Operating time meter for tape recorder N85-21537
TIME OF FLIGHT SPECTROMETERS
In-beam tests of an air-core superconducting-solenoid particle spectrometer
[DE85-004029] N85-21625
TIME SERIES ANALYSIS
Analysis of selective chopper radiometer data
[NASA-CR-175157] N85-21894
A review of some aspects of robust inference for time series
[AD-A149706] N85-22082
TIN ALLOYS
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process
[DE85-003212] N85-22191
TIP SPEED
Further comparison of wind tunnel and airplane acoustic data for advanced design high speed propeller models
[NASA-TM-86935] N85-22108
TIRES
Technique to analyze vehicle coastdown data
[DE85-005159] N85-21127
TISSUES (BIOLOGY)
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
TITANIUM
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334
TITANIUM ALLOYS
Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
Alloy development, processing and characterization of devitrified titanium base microcrystalline alloys
[AD-A149609] N85-21327
Proton NMR and susceptibility measurements in TiCoH/sub x
[DE85-003309] N85-21336
Comparison of the fatigue resistance (initiation, propegation) of cast TA6V with hot rolled TA6V — titanium alloy
[DGT-25369-PT-1] N85-21341
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process
[DE85-003212] N85-22191
TITANIUM OXIDES
Degradation mechanisms in ceramic dielectrics
[AD-A149791] N85-21369
TOKAMAK DEVICES
Determination of experimental Tokamak plasma properties using maximum entropy analysis
[DE85-001723] N85-22165
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172
TOLERANCES (PHYSIOLOGY)
Role of mental work in human tolerance in total-body vibration N85-21940
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rheseus monkeys N85-21946
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962
TOMOGRAPHY
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
A new NDE (Non-Destructive Evaluation) capability for thin-shelled structures
[AD-A149625] N85-21678
TOOLS
Connection system — insuring against loss of a tool component without using multiple tethers
[NASA-CASE-MSC-20319-1] N85-21649
TOPOGRAPHY
Design issues in video disc map display
[AD-A149646] N85-21760
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
Planetary cartography in the next decade (1984 - 1994)
[NASA-SP-475] N85-22323
Physiography of the Martian west equatorial uplift N85-22325
TOPOLOGY
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326
TORSION
Rheology of dissemination
[AD-A150006] N85-21373
TORSIONAL VIBRATION
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
TORSO
Torso sizing ring construction for hard space suit
[NASA-CASE-ARC-11616-1] N85-21987
TOWED BODIES
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
TOXIC HAZARDS
Methods/materials matrix of ultimate disposal techniques for spilled hazardous materials
[PB85-116853] N85-21833
Assessment of hazardous waste surface impoundment technology case studies and perspectives of experts
[PB85-117059] N85-21834
Summary report of the Workshop on Structure Activity Concepts in Environmental Sciences
[PB85-137339] N85-21841
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948
TOXICITY
Role of biological assessment in effluent control
[PB85-116101] N85-21830
Toxicity, mutagenesis and aging due to endogenous oxygen radicals
[AD-A150121] N85-21928
Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials
[AD-A149647] N85-21961
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966
TOXICOLOGY
Air quality criteria for ozone and other photochemical oxidants. External review draft, volume 4
[PB85-126068] N85-21838
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966
TRACKED VEHICLES
Skid steering of wheeled and tracked vehicles: Analysis with Coulomb friction assumptions
[AD-A149826] N85-21664
TRACKING (POSITION)
Wind-weighting for sounding rockets with a telemetry system
[NASA-TP-2438] N85-21246
Observational study of transport in the free troposphere
[PB85-144145] N85-21845
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
TRACKING FILTERS
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
TRAFFIC
Base communications issues for the 1980s
[AD-A149764] N85-21474
TRAINING AIRCRAFT
Collision avoidance for Naval training aircraft
[FAA/PM-84-4] N85-21136
TRAINING DEVICES
New flight simulators at Vnukovo permit less in-flight training N85-21107
TRANSDUCERS
Compensation of skew passband of a SAW filter using predistortion N85-21422
Thin film strain transducer — suitable for in-flight measurement of scientific balloon strain
[NASA-CASE-WLP-10055-2] N85-21598
TRANSFER FUNCTIONS
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
TRANSFER ORBITS
Space debris protection for a reusable orbital transfer vehicle N85-21208
The long term behaviour of Earth orbits and the implications for debris control N85-21213
Radiation exposure and performance of multiple burn LEO-GEO orbit transfer trajectories
[NASA-TM-86946] N85-21228

TRANSFORMATIONS
Tests of fit based on normalized spacings
[AD-A149749] N85-22062
TRANSFORMATIONS (MATHEMATICS)
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071
Harmonic analysis and Radon transforms on pencils of geodesics
[CWI-PM-R8413] N85-22074
TRANSFORMERS
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632
TRANSIENT LOADS
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
TRANSIENT RESPONSE
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9667-MS] N85-21576
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
TRANSISTOR CIRCUITS
Transistor-transistor logic microcircuit tester
N85-21556
TRANSLATING
The portable LISP translation tool
[AD-A149765] N85-22023
TRANSLATIONAL MOTION
Processing dynamic image sequences from a moving sensor
[AD-A149984] N85-22148
TRANSMISSION EFFICIENCY
Automated radome testing
[AD-P004362] N85-21456
TRANSMISSION LINES
A process to produce fine line metallic collection patterns on semiconductors devices
[NASA-CASE-NPO-16413-1] N85-21325
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632
TRANSMISSION LOSS
Measurements and predictions of HF ground wave radio propagation over irregular, inhomogeneous terrain
[PB85-110866] N85-21487
Noise transmission loss of a rectangular plate in an infinite baffle
[NASA-TP-2396] N85-22109
TRANSMISSOMETERS
Atmospheric transmissometer
[AD-D011540] N85-22140
TRANSMITTER RECEIVERS
Quartz filter transceiver N85-21538
TRANSMITTERS
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
TRANSONIC FLOW
Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
Unsteady transonic pressure measurements on a semi-span wind-tunnel model of a transport-type supercritical wing (Lann model). Part 2: Pressure distributions (plotted) and plots of the vibration modes
[AD-A130488] N85-21579
Robust calculation of three-dimensional transonic potential flow based on the nonlinear gas multigrid method and a mixed incomplete lower upper decomposition/strongly implicit procedure (ILU/SIP) algorithm
[NLR-MP-84003-U] N85-21593
TRANSONIC FLUTTER
A study of transonic flutter of a two-dimensional airfoil using the U-g and p-k methods
[LR-615] N85-21121
TRANSONIC WIND TUNNELS
Exploratory flutter test in a cryogenic wind tunnel
[NASA-TM-86380] N85-21689
TRANSPARENCE
Process for preparing highly optically transparent-colorless armomatic polyimide film
[NASA-CASE-LAR-13351-1] N85-21360
Progress on transparent yttria
[AD-P004370] N85-21464
TRANSPORT AIRCRAFT
New runway enables IL-76 flights to Tenkeli in far north N85-21108
Integrated paratroop door
[AD-D011507] N85-21148
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154
TRANSPORT PROPERTIES
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9667-MS] N85-21576
ELECT groundwater transport research code
[DE85-003284] N85-21824
Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116176] N85-21831
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125
TRANSPORT THEORY
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
TRANSPORTATION
Transportation
[JPRS-UTR-85-004] N85-21105
Current development, applications of airships in USSR
N85-21109
TRANSPORTER
An air-breathing ballistic space transporter for Europe
[NASA-TM-77645] N85-21244
TRANSVERSE WAVES
Explosive transverse electric field and particle acceleration during magnetic collapse — cosmic plasma
N85-22292
TRAPPED PARTICLES
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment
[AD-A149728] N85-21252
S3-3 ONR-118 data analysis
[AD-A149725] N85-21855
TRAPPING
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193
TRAVELING SALESMAN PROBLEM
Local search in routing problems with time windows
[CWI-OS-R8409] N85-22075
TRAVELING WAVES
Performance ranges of helical antenna made of conductor with extra bends N85-21536
Behavior of small ferromagnetic particles in traveling magnetic field N85-21584
TREES (PLANTS)
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
TRIBOLOGY
Tribological properties of boron nitride synthesized by ion beam deposition
[NASA-TM-86962] N85-21355
Tribological systems as applied to aircraft engines
[NASA-TM-86965] N85-21657
TRITIUM
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
TROPICAL METEOROLOGY
Accuracy of typhoon center determined by GMS imagery N85-21687
TROPICAL STORMS
Intensification of tropical instabilities
[AD-A149985] N85-21899
TROPOSPHERE
Observational study of transport in the free troposphere
[PB85-144145] N85-21845
Global tropospheric chemistry: A plan for action
[NASA-CR-175545] N85-21865
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
Intensification of tropical instabilities
[AD-A149985] N85-21899
TROUGHS
The origin and evolution of terrestrial and Martian rock labyrinths
[NASA-CR-175511] N85-22326
TRUSSES
Alternative approximation concepts for space frame synthesis
[NASA-CR-172526] N85-21150
Variable geometry truss concept
[REPT-614] N85-21697
TSUNAMI WAVES
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117984] N85-21869
TUNABLE LASERS
Portable remote laser sensor for methane leak detection
[NASA-CASE-NPO-15790-1] N85-21631
Advanced crystalline laser materials
[DE85-003142] N85-21647
TUNERS
Imaging apparatus for transverse electrode electro-optic tunable filter
[AD-D011524] N85-21497
TUNGSTEN
Negative lithium emission from a tungsten surface in a plasma
[DE85-003456] N85-22167
TUNGSTEN ALLOYS
Stress corrosion cracking behavior of tungsten heavy alloys
[AD-A149843] N85-21329
TUNGSTEN CARBIDES
Calibration method for acoustic scattering measurements using a spherical target
[AD-D011521] N85-22106
TURBINE BLADES
Nonlinear analysis for high-temperature multilayered fiber composite structures — turbine blades
[NASA-TM-83754] N85-21273
High pressure turbine rotor two-piece blade retainer
[AD-D011498] N85-21653
Cooled turbine blade tip closure
[AD-D011525] N85-21654
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
TURBINE ENGINES
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
TURBOCOMPRESSORS
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3878] N85-21117
TURBOMACHINE BLADES
Tailored airfoils for vertical axis wind turbines
[DE85-004628] N85-21128
TURBOMACHINERY
Analysis of experimental shaft seal data for high-performance turbomachines, as for Space Shuttle main engines
[NASA-TM-86928] N85-21569
TURBULENCE
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125
Time and space variability of turbulent concentration fluctuations
[AD-A149963] N85-21898
Methods of progressing waves in turbulent media with applications to acoustics
[AD-A149599] N85-22055
Plasma performance of TFCX and jet with sawtoothing
[DE85-003335] N85-22168
Processes and problems in secondary star formation
[DE85-003623] N85-22322
TURBULENCE EFFECTS
Magnetohydrodynamic (MHD) turbulence in radio galaxies N85-22305
TURBULENT BOUNDARY LAYER
Flight-measured laminar boundary-layer transition phenomena including stability theory analysis
[NASA-TP-2417] N85-21118

TURBULENT DIFFUSION
Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena
[PB85-137370] N85-21844
TURBULENT FLOW
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
Investigation of flowfields found in typical combustor geometries
[NASA-CR-3889] N85-21167
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292
Kinetics of nitric oxide formation in laminar and turbulent methane combustion
[PB85-149698] N85-21313
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149869] N85-21583
Time and space variability of turbulent concentration fluctuations
[AD-A149963] N85-21898
Hydrodynamic stability problem formulated by numerical solutions of the Navier-Stokes equations N85-22223
TURBULENT HEAT TRANSFER
An experimental investigation of flap turbulent heat transfer and pressure characteristics in hypersonic flow N85-21426
TWO DIMENSIONAL FLOW
Transonic interactions of unsteady vortical flows
[NASA-TM-86858] N85-21113
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
Numerical integration of the unsteady full-potential equation with applications to transonic flow about a two-dimensional airfoil
[NLR-MP-84022-U] N85-21130
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150080] N85-21587
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
TWO PHASE FLOW
TRACR3D: A model of flow and transport in porous/fractured media
[LA-8667-MS] N85-21576
Two-phase flow in geothermal systems
[DE85-004692] N85-21591
TYPE 3 BURSTS
Arguments for fundamental emission by the parametric process L yields T + S in interplanetary type III bursts — langmuir, electromagnetic, ion acoustic waves (L, T, S) N85-22311
TYPHOONS
Meteorological Satellite Center Technical Note No. 10, 1984
[MSC-TN-10] N85-21884
On the relative motion of typhoons: In the case of Typhoon 8305 and Typhoons 8306 and 8307 N85-21885
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
Accuracy of typhoon center determined by GMS imagery N85-21887

U

U.S.S.R.
Transportation
[JPRS-UTR-85-004] N85-21105
Current development, applications of airships in USSR N85-21109
U.S.S.R. SPACE PROGRAM
The space flight of the Soviet-Indian crew
[NASA-TM-77615] N85-21226
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
ULTRASONIC FLAW DETECTION
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
ULTRASONIC RADIATION
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra
[DE85-003259] N85-22114
ULTRASONIC TESTS
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269
The role of dislocations in ultrasonic attenuation
[AERE-R-11384] N85-21317
Application of homomorphic signal processing to stress wave factor analysis N85-21673
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra
[DE85-003259] N85-22114
ULTRASONIC WAVE TRANSDUCERS
New types of power supplies for ultrasonic processing equipment N85-21566
ULTRASONICS
Dynamic world modeling for an intelligent mobile robot using a rotating ultra-sonic ranging device
[AD-A149979] N85-21143
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor
[DE85-003663] N85-21337
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
ULTRAVIOLET RADIATION
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
ULTRAVIOLET SPECTRA
The ultraviolet excess of quasars 3: The highly polarized quasars PKS 0736+017 and PKS 1510-089
[NASA-CR-175576] N85-22268
A survey of Mg II h and k emission in near-solar type stars
[NASA-CR-175572] N85-22269
Plasma processes in Herbig-Haro objects N85-22301
NIMBUS-7 SBUV (Solar Backscatter Ultraviolet) observations of solar UV spectral irradiance variations caused by solar rotation and active-region evolution for the period November 7, 1978 - November 1, 1980
[NASA-CR-175544] N85-22334
UNCONTROLLED REENTRY (SPACECRAFT)
Orbital debris policy issues: Battelle involvement and some personal observations N85-21218
UNDERCARRIAGES
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156
UNDERGROUND STORAGE
Shallow land burial technology: Humid
[DE85-004432] N85-22136
UNDERGROUND STRUCTURES
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
UNDERWATER ACOUSTICS
A stochastic-mechanical approach to acoustic pulse propagation in the deep ocean sound channel
[AD-A149598] N85-22110
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida
[AD-A149869] N85-22111
UNITED KINGDOM
A review of fatality, impairment of consciousness and head and neck injury on Royal Air Force ejections 1968-1981 N85-21975
UNITED STATES
Shallow magma targets in the western US
[DE85-003274] N85-21803
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
A review of neck injury and impaired consciousness associated with US Navy ejections 1 January 1969 - 31 December 1979 N85-21973
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida
[AD-A149869] N85-22111
UNIVERSE
Cosmology, galactic astronomy and elementary particle physics N85-22269
UNIVERSITIES
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
UNSTEADY FLOW
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
Numerical integration of the unsteady full-potential equation with applications to transonic flow about a two-dimensional airfoil
[NLR-MP-84022-U] N85-21130
UPWASH
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
URETHANES
Plasticizer system for propellant compositions
[AD-D011502] N85-21390
Plasticizer system for propellant compositions
[AD-D011517] N85-21395
USER MANUALS (COMPUTER PROGRAMS)
A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
User's guide to the TAMW wheat model as implemented on the IBM 360/195 computer
[E85-10084] N85-21749
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
User's manual for the University of Houston individual heliostat layout and performance code
[DE85-004843] N85-21808
A user's guide to sensitivity testing on computer models at Los Alamos National Laboratory
[LA-10104-M] N85-22018
Implementation of the computer program-system MOSS (Map Overlay and Statistical System) on a VAX-11 series computer under VMS
[AD-A149612] N85-22019
User's guide for NPSOL (Version 2.1): A FORTRAN package for quadratic programming
[AD-A150078] N85-22028
METC VAX-IBM guide to ASPEN
[DE85-001974] N85-22031
VAX-ASPEN installation guide
[DE85-001973] N85-22032
Microcomputers in transit: A software handbook
[PB85-136414] N85-22042
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125
USER REQUIREMENTS
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260

V

V/STOL AIRCRAFT
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
Some aspects of the design of a fly-by-wire flying control system for a supersonic V/STOL fighter aircraft
[COLL-AERON-8413] N85-21175
VACUUM
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624
Review of anode phenomena in vacuum arcs
[DE85-002736] N85-22101
VACUUM DEPOSITION
Diamondlike flakes
[NASA-CASE-LEW-13837-2] N85-21267

VALENCE
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183
The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184
VALIDITY
AFOS (Automation of Field Operations and Services)-ERA forecast verification, September 1984
[PB85-137578] N85-21912
A note on validity generalization procedures
[AD-A150065] N85-22085
VALSALVA EXERCISE
Main component method used to study variations of cardiovascular parameters N85-21939
VALVES
Pneumatic clamping device
[AD-D011544] N85-21656
VANADIUM ALLOYS
Partial replacement of chromium in austenitic stainless steels by molybdenum, copper, and vanadium, report of investigations 1984
[PB85-116508] N85-21346
VANADIUM COMPOUNDS
Scale-up of vanadium trineodecanoate
[AD-A149935] N85-21370
VAPOR DEPOSITION
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
VAPOR PHASE EPITAXY
Preparation of crystal growth experiments in Spacelab: Si (FSLP), CdTe (D1), ZnS (D1)
[BMFT-FB-W-84-045] N85-21227
1.5 to 1.7 micrometers LEDs (Light-Emitting Diode)
[AD-A149685] N85-21508
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177
VAPOR PRESSURE
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles
[DE85-004319] N85-21306
VAPORIZERS
Continuous laminar smoke generator
[NASA-CASE-LAR-13014-1] N85-21178
VAPORS
Photo-thermal detection of the onset of photo-chemical nucleation (laser-snow) in vapor
[AD-A150111] N85-21295
VARIABLE GEOMETRY STRUCTURES
Variable geometry truss concept
[REPT-614] N85-21697
VARIATIONAL PRINCIPLES
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
VARIATIONS
The portable LISP translation tool
[AD-A149765] N85-22023
VAX-11 SERIES COMPUTERS
Implementation of the computer program-system MOSS (Map Overlay and Statistical System) on a VAX-11 series computer under VMS
[AD-A149612] N85-22019
VEGA PROJECT
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives
[NASA-TM-77536] N85-22324
VEGETATION
Thematic Mapper spectral dimensionality and data structure N85-21736
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10082] N85-21747
Air quality criteria for ozone and other photochemical oxidants, external review draft, volume 3
[PB85-126050] N85-21837
VEGETATION GROWTH
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
Estimating solar radiation for plant simulation models
[E85-10089] N85-21751
Modular plant culture systems for life support functions
[NASA-CR-171853] N85-21924
VEHICLE WHEELS
Skid steering of wheeled and tracked vehicles: Analysis with Coulomb friction assumptions
[AD-A149826] N85-21684
VELOCITY
Digital temperature and velocity control of mach 0.3 atmospheric pressure durability testing burner rigs in long time, unattended cyclic testing
[NASA-TM-86959] N85-21321
Speed and accuracy in automated manufacture
[DE85-003913] N85-21410
Basic studies of gases for fast switches
[AD-A149828] N85-21514
VELOCITY DISTRIBUTION
Surface-slip equations for multicomponent nonequilibrium air flow
[NASA-TM-85820] N85-21573
Velocity distributions of solar wind ions and electrons N85-22273
Plasma in the clusters of galaxies N85-22299
VELOCITY MEASUREMENT
Assessment of satellite collision hazards by simulated sampling in space N85-21195
In situ orbital debris experiment concepts N85-21198
Use of ground radar to detect reentering debris N85-21200
Solid particle receiver experiments: Velocity measurements
[DE85-000257] N85-21623
VENTILATION
Theoretical and experimental investigations of dust loaded flow fields in industrial halls
[BMFT-FB-HA-84-044] N85-21411
Spirolit-2 instrument used to test pulmonary ventilation N85-21950
VENUS (PLANET)
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives
[NASA-TM-77536] N85-22324
VERTICAL ORIENTATION
Along-track deflection of the vertical from SEASAT: GEBCO (General Bathymetric Chart of the Oceans) overlays
[PB85-129641] N85-21767
VERTICAL TAKEOFF AIRCRAFT
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126
VERY HIGH FREQUENCIES
Improvement of VHF(MB) model
[AD-A150067] N85-21480
VERY LARGE SCALE INTEGRATION
Design of a bit-sliced processor array with built-in-self-test
[AD-A149785] N85-21513
Built-in tests for VLSI (Very Large Scale Integration) finite-state machines
[AD-A149784] N85-21997
VERY LOW FREQUENCIES
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources
[AD-A149838] N85-21470
A new radio emission at 3 kHz in the outer heliosphere N85-22312
VIBRATION
On the coupling of an anchored flame with an acoustic field
[COLL-AERON-8434] N85-21282
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742
VIBRATION DAMPING
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21686
VIBRATION EFFECTS
Propeller propulsion system integration: State of technology survey
[NASA-CR-3882] N85-21119
Role of mental work in human tolerance in total-body vibration N85-21940
Singular asymptotic expansions in nonlinear rotordynamics N85-22218
VIBRATION ISOLATORS
Evaluation of air and ground launched cruise missile navigational element containers
[AD-A149654] N85-21138
VIBRATION MODE
Unsteady transonic pressure measurements on a semi-span wind-tunnel model of a transport-type supercritical wing (Lann model). Part 2: Pressure distributions (plotted) and plots of the vibration modes
[AD-A130486] N85-21579
VIBRATION TESTS
Steam generator tube vibration tests
[DE85-003599] N85-21712
VIBRATIONAL SPECTRA
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856
VIDEO DATA
Television animation store: Digital chroma, key and mixer units
[BBC-RD-1984/16] N85-21442
VIDEO DISKS
Design issues in video disc map display
[AD-A149646] N85-21760
VIDEO SIGNALS
Television camera video level control system
[NASA-CASE-MSC-18578-1] N85-21427
VIRGINIA
Intraband radiometric performance of the LANDSAT 4 Thematic Mapper — Washington, DC, Arkansas, Massachusetts, Virginia, and Arizona N85-21738
VIRIAL THEOREM
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419
VISCOELASTICITY
Accelerated viscoelastic characterization of T300-5208 graphite-epoxy laminates
[NASA-CR-3871] N85-21271
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Journal of Research of the National Bureau of Standards, volume 89, number 2, March - April 1984
[PB85-115426] N85-22103
VISCOPLASTICITY
Viscoplastic constitutive relationships with dependence on thermomechanical history
[NASA-CR-174836] N85-21691
VISCOUS DRAG
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3884] N85-21272
VISIBILITY
Impact of aerosols on visibility and climate: A report prepared for Panel 3, Environmental Impact, of the NATO/CCMS Air Pollution Pilot Study on Air Pollution Control Strategies and Impact Modelling
[PB85-106744] N85-21906
The accuracy in calculations of intervisibility with digital terrain models — digital models
[FOA-C-20557-D6(E1)] N85-21983
VISIBLE INFRARED SPIN SCAN RADIOMETER
VISSR infrared calibration by means of calculated radiances N85-21889
GMS operational calibration procedure and status N85-21893
VISION
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149682] N85-21980
VISUAL DISCRIMINATION
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149682] N85-21980
VISUAL OBSERVATION
The state of the art in printed wiring board inspection
[AD-A149671] N85-21679
VISUAL PERCEPTION
The accuracy in calculations of intervisibility with digital terrain models — digital models
[FOA-C-20557-D6(E1)] N85-21983
VOICE COMMUNICATION
Base communications issues for the 1980s
[AD-A149764] N85-21474
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
Tubes and transistors in audio amplifiers N85-21532
VOICE CONTROL
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
VOICE DATA PROCESSING
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
VOLCANOES
Catalog of submarine volcanoes and hydrological phenomena associated with volcanic events: 1500 BC to 31 Dec. 1899
[PB85-117984] N85-21869
VOLTIMETERS
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water
[DE85-002781] N85-21619
VORTEX SHEETS
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
VORTICES
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113

Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3864] N85-21272
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423
Calculation of the flow around thick wings with separation vortices N85-21424
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149851] N85-21582
A supplement study on the subsynoptic cloud system off the south coast of Japan N85-21892

VORTICITY TRANSPORT HYPOTHESIS
Behavior of small ferromagnetic particles in traveling magnetic field N85-21564

VOYAGER PROJECT
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327

VULCANIZED ELASTOMERS
Simple EOS for the silicone rubber Sylgard 184
[DE85-001394] N85-21376

VULNERABILITY
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22089

W

WAFERS
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability
[AD-A150004] N85-21515
Ingot slicing machine and method
[NASA-CASE-NPO-15483-1] N85-21650

WAKES
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124

WALL FLOW
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
A three-dimensional spectral algorithm for simulations of transition and turbulence
[NASA-CR-172561] N85-21575

WALLS
Integrated insulation wall assembly — for a solid rocket motor case
[AD-D011553] N85-21257
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15651-1] N85-21652

WASTE DISPOSAL
ELECT groundwater transport research code
[DE85-003284] N85-21824
Role of biological assessment in effluent control
[PB85-116101] N85-21830
Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116176] N85-21831
Methods/materials matrix of ultimate disposal techniques for spilled hazardous materials
[PB85-116853] N85-21833
Assessment of hazardous waste surface impoundment technology case studies and perspectives of experts
[PB85-117059] N85-21834
Shallow land burial technology: Humid
[DE85-004432] N85-22136
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138

WASTE TREATMENT
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828

WATER
Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
Parametric evaluation of ball milling of SiC in water
[NASA-TM-86974] N85-21356
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water
[DE85-002761] N85-21619
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823

WATER BALANCE
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943

WATER INJECTION
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122

WATER POLLUTION
Isolation, concentration and subsequent analysis by capillary gas chromatography of trace amounts of organophosphorus compounds from aqueous samples
[AD-B089301L] N85-21308
Role of biological assessment in effluent control
[PB85-116101] N85-21830
Standard analytical procedures of the NOAA National Analytical Facility, 1984-85: Extractable toxic organic compounds
[PB85-126282] N85-21840

WATER QUALITY
Role of biological assessment in effluent control
[PB85-116101] N85-21830

WATER RESOURCES
Building a functional, integrated GIS/remote sensing resource analysis and planning system — Utah
[E85-10092] N85-21754

WATER VAPOR
Electrochemical cell to measure corrosion rates in noncondensing environments
[DE85-003148] N85-21338
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150

WATER WAVES
The imaging of internal waves by the SEASAT-A synthetic aperture radar
[AD-A149808] N85-21761
Hurricane alicia storm surge and wave data
[AD-A149668] N85-21896

WATERPROOFING
Shallow land burial technology: Humid
[DE85-004432] N85-22136

WAVE EQUATIONS
Research in theoretical nuclear physics
[DE85-004349] N85-22137

WAVE PROPAGATION
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
Waveform control and application of detonation wave in explosives N85-21420
Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
Double reference pulsed phase locked loop (DRP-2L-2)
[NASA-CASE-LAR-13310-1] N85-21441
Survivable propagation
[AD-A150070] N85-21478
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862
Methods of progressing waves in turbulent media with applications to acoustics
[AD-A149599] N85-22055

WAVE REFLECTION
Application of homomorphic signal processing to stress wave factor analysis N85-21673

WAVEFORMS
Waveform control and application of detonation wave in explosives N85-21420
Estimation of the impulse response of television channels from digitized waveforms
[CRC-1376] N85-21429

WAVEGUIDE LASERS
Life study of RF excited Hg arc lamps and CO2 waveguide lasers
[AD-A149618] N85-21640

WAVEGUIDES
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-175507] N85-21438
Single-cavity SLED device
[DE85-002567] N85-22117

WAVELENGTHS
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths
[DE85-000862] N85-21646
Phase function, backscatter, extinction, and absorption for standard radiation atmosphere and El Chichon aerosol models at visible and near-infrared wavelengths
[NASA-TM-86379] N85-21874

WEAK INTERACTIONS (FIELD THEORY)
Theoretical nuclear physics
[DE85-003466] N85-22135

WEAPON SYSTEMS
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454

WEAR
Ion-beam nitriding of steels
[NASA-CASE-LEW-14104-1] N85-21324
Tribological systems as applied to aircraft engines
[NASA-TM-86965] N85-21657
Applications of vibration analysis to the condition monitoring of roiling element bearings
[ARL-AERO-PROP-R-163] N85-21663

WEATHER
Monthly and seasonal weather outlook for January 1985, volume 39, number 1
[PB85-148799] N85-21915

WEATHER FORECASTING
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
Space Shuttle interactive meteorological data system study
[NASA-CR-171418] N85-21876
Hurricane storm surge research
[GPO-40-048] N85-21880
On the error of typhoon intensity estimation by means of IR Dvorak technique occurring when the eye is very small N85-21886
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
Navy tactical applications guide. Volume 4. Part 1. Eastern North Pacific weather analysis and forecast applications
[AD-A150097] N85-21900
FTASUM: Aviation forecast summaries
[PB85-112977] N85-21908
SAOSUM: A short summary of observations
[PB85-120384] N85-21909
Preliminary results of associating cloud-to-ground lightning with surface convergence and radar reflectivity at Kennedy Space Center in 1983
[NASA-CR-175543] N85-21910
TRAJ: Single station trajectory plot
[PB85-135002] N85-21911
AFOS (Automation of Field Operations and Service) surface observation decoding
[PB85-137586] N85-21913

WEATHERING
NBS solar collector durability/reliability test program
[DE85-003489] N85-21801

WEDGE FLOW
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577

WEIGHTING FUNCTIONS
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547

WEIGHTLESSNESS
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984
[JPRS-USB-85-002] N85-21931
External respiration, gas exchange and energy expenditures of man in weightlessness N85-21932
Circadian rhythm of human body temperature during spaceflights N85-21934
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936
LBNP training of crew members on main missions aboard Salyut-6 orbital station N85-21938
Human lung fluid content during 7-day head-down tilt N85-21941
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951

WELD STRENGTH
Effects of neutron irradiation on the fracture properties of HT-9 weld
[DE85-001068] N85-21339

WELD TESTS
Effects of neutron irradiation on the fracture properties of HT-9 weld
[DE85-001068] N85-21339
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224
WELDABILITY
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224
WELDED JOINTS
NASA welding assessment program
[NASA-CR-175512] N85-21661
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224
WELDING MACHINES
Characterization of the heat source distribution of a typical GTAW welding arc
[DE85-004322] N85-21670
WEST GERMANY
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
WETTING
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
WHEAT
User's guide to the TAMW wheat model as implemented on the IBM 360/195 computer
[E85-10084] N85-21749
NOAA-AISC user's guide for implementing CERES wheat model for large area yield estimation
[E85-10085] N85-21750
WIGNER COEFFICIENT
The ambiguity function and the Wigner distribution
[AD-A150095] N85-21482
WIND (METEOROLOGY)
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860
Los Alamos MINI-Review: Tracking Antarctic winds
[DE85-004597] N85-21903
WIND EFFECTS
Algorithms for automatic four-dimensional aircraft guidance, considering the momentary wind situation
[DFVLR-FB-84-40] N85-21146
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881
On the wind error of the Finnish raingauge
[REPT-37] N85-21883
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
List of head/neck injury on ejection in the German Armed Forces from 1972-1981 N85-21972
WIND MEASUREMENT
Wind-weighting for sounding rockets with a telemetry system
[NASA-TP-2438] N85-21246
WIND PROFILES
Phased antenna array for wind profiling applications
[PB85-132684] N85-21529
Oceanographic and meteorological research based on the data products of SEASAT
[E85-10091] N85-21753
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21860
Atmospheric environment for Space Shuttle (STS-51A) launch
[NASA-TM-86497] N85-21875
WIND SHEAR
Wind shear detection technology
[GPO-38-920] N85-21879
Intensification of tropical instabilities
[AD-A149985] N85-21899
WIND TUNNEL TESTS
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110
Measured unsteady transonic aerodynamic characteristics of an elastic supercritical wing with an oscillating control surface
[NASA-TM-86376] N85-21116
Unsteady transonic pressure measurements on a semi-span wind-tunnel model of a transport-type supercritical wing (Lann model). Part 2: Pressure distributions (plotted) and plots of the vibration modes
[AD-A130488] N85-21579
Exploratory flutter test in a cryogenic wind tunnel
[NASA-TM-86380] N85-21689
Further comparison of wind tunnel and airplane acoustic data for advanced design high speed propeller models
[NASA-TM-86935] N85-22108
WIND TURBINES
Tailored airfoils for vertical axis wind turbines
[DE85-004628] N85-21126
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats
[DE85-000529] N85-21805
WINDOWS (APERTURES)
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304
Improvements in glazings: SERI materials research in progress
[DE84-013049] N85-21378
WINDPOWER UTILIZATION
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats
[DE85-000529] N85-21805
WING PLANFORMS
Calculation of the flow around thick wings with separation vortices N85-21424
WINGS
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
WINTER
Sector analysis of relevant meteorological parameters for long range transport of air pollutants
[NR-27] N85-21882
WIRE
A moment solution for an arbitrary configuration of partly shielded wires above a ground plane
[AD-A149762] N85-21473
Method and apparatus for detecting acoustic emissions from metal matrix wire
[AD-D011556] N85-22107
WISCONSIN
Rationale and basic design for experimental acidification of a lake ecosystem in Northern Wisconsin
[PB85-116077] N85-21629
WORK CAPACITY
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980
WORKING FLUIDS
Leak detectors for organic Rankine cycle power plants: On-line and manual methods
[DE85-002792] N85-21617
Thermophysical properties of working fluids for binary geothermal cycles
[DE85-000385] N85-21804
WORKLOADS (PSYCHOPHYSIOLOGY)
Operations concept for the advanced automation system man-machine interface
[AD-A149797] N85-21139
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980

X

X RAY ANALYSIS
The clinical and radiological assessment of cervical injury, Annex A N85-21976
Head/neck injury: Post mortem procedures, Annex B N85-21977
X RAY ASTRONOMY
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266
X-ray astronomy and plasma astrophysics N85-22268
X RAY ASTROPHYSICS FACILITY
Study of the potential usefulness of superfine holographic x-ray gratings in AXAF and astrophysics in general N85-22215
X RAY DENSITY MEASUREMENT
X-ray gauge measures areal density variations as small as 0.1%
[DE85-003774] N85-21629
X RAY IMAGERY
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266
X RAY SCATTERING
Magnetic X-ray scattering studies of the rare Earth metal holmium
[DE85-003608] N85-21335
X RAY SOURCES
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
X RAY SPECTRA
Plasma in the clusters of galaxies N85-22299
X RAY SPECTROSCOPY
Description of the SSB/A (Special Sensor B/Aerospace X-ray spectrometer
[AD-A150040] N85-21236
Some unique aspects of fouling on copper as compared to titanium or nickel
[AD-A150072] N85-21332
Development and application of low energy X-ray and electron physics
[AD-A149983] N85-22099
The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184
X RAY TELESCOPES
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
X RAY TUBES
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
X RAYS
Development and application of low energy X-ray and electron physics
[AD-A149983] N85-22099
XENON FLUORIDE LASERS
Investigation of plasma processes in electronic transition lasers
[AD-A149682] N85-21506

Y

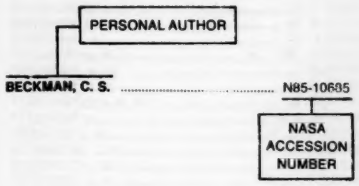
YIELD
NOAA-AISC user's guide for implementing CERES maize model for large area yield estimation
[E85-10083] N85-21748
YIELD POINT
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21718
YIELD STRENGTH
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21718
YTTRIUM
Compatibility experiments of facilities, materials, and propellants for electrothermal thrusters
[NASA-TM-86956] N85-21260
YTTRIUM OXIDES
Progress on transparent yttria
[AD-P004370] N85-21484

Z

ZINC
Humidity effects on adhesion of nickel-zinc ferrite in elastic contact with magnetic tape and itself
[NASA-TP-2449] N85-21359
Research on separators for alkaline zinc batteries
[DE85-003082] N85-21523
ZINC COATINGS
High strength steel sheet with dual phase structure
[BMFT-FB-T-84-219] N85-21342
ZIRCALOYS (TRADEMARK)
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor
[DE85-003663] N85-21337

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

AARSSE, A. T. N85-21814
ABERNETHY, K. N85-22211
ABNEY, L. D. N85-22205
ABOLITS, A. N85-21534
ABRAMS, R. L. N85-21497
ACAR, B. S. N85-22077
ACHAR, B. N. N85-21348
N85-21361
ADAMS, J. E. N85-21487
ADAMS, J. W. N85-21367
ADAMS, M. S. N85-21120
ADAMS, R. M. N85-21837
ADELMAN, H. M. N85-21695
ADLER, R. N85-21766
ADORNATO, R. J. N85-21211
AGRAWAL, A. K. N85-21426
AKAI, K. N85-21255
AKERS, R. L. N85-22005
AKIBA, R. N85-21578
AKSEL, B. N85-21692
ALBANO, E. V. N85-21294
ALCOUFFE, R. E. N85-22009
ALEXOPOULOS, N. G. N85-21517
ALFVEN, H. N85-22271
ALKEZWEENY, A. J. N85-21902
ALLAN, L. N85-21961
ALLEN, D. R. N85-21722
ALLEN, H. C. N85-21396
ALLEN, S. L. N85-22170
ALMAGOR, G. N85-21921
ALTHOF, J. N85-21800
ALVAREZ, J. M. N85-21192
ALVIS, R. L. N85-21802
AMATI, M. N85-22314
AMS, M. L. N85-21745
AMMERMAN, H. A. N85-21139
AN, C. H. N85-22330
ANDERSON, B. N85-21648
ANDERSON, C. E., JR. N85-21365
ANDERSON, H. U. N85-21307
ANDERSON, L. M. N85-21492
N85-21766
ANDERSON, R. L. N85-21624
ANDERTON, D. A. N85-21251
ANDRETSOV, V. A. N85-21938
ANDREWS, J. W. N85-21136
ANG, P. G. P. N85-21314
ANSELL, G. S. N85-21268
ANTIOCHOS, S. K. N85-22330
ANTON, D. J. N85-21969
ANTONELLO, E. N85-22320
ANUTA, P. E. N85-21731
N85-21741
ARAGONES, J. M. N85-22295
ARAI, T. N85-22208
ARENAS, G. N85-21792
ARI, N. N85-21709
ARNDT, W. N85-21795
ARNOLD, F. E. N85-21372
ARNOLD, G. W. N85-22200
ASH, R. L. N85-21606
ASKUE, C. A. N85-21695
ASLANIDIS, I. N85-21322
ASSEO, E. N85-22306
N85-22316
ASTON, G. N85-21491
ATHANS, M. N85-22068
AUCHTER, H. N85-21238
AUERBACH, J. M. N85-21621
AULD, F. W. N85-21656
AULICH, H. N85-21777
AXE, J. D. N85-22194
AXNAES, I. N85-22301
AYRES, R. U. N85-21989

B

BAAKLINI, G. Y. N85-21674
BAARS, J. N85-21171
BACKLUND, J. G. N85-21148
BADERTSCHER, E. N85-22074
BADGLEY, P. R. N85-21163
BAGANOFF, D. N85-21170
BAGG, M. M. N85-21761
BAI, Z. D. N85-22065
BAIER, R. E. N85-21927
BAILEY, R. E. N85-21177
BAILEY, W. R. N85-21241
BAK, M. J. N85-21686
BAKER, D. N. N85-21861
BAKER, E. G. N85-21833
BALABAN, M. M. N85-21474
BALAGEAS, D. L. N85-21466
BALDWIN, G. R. N85-21721
BALLATO, A. N85-22168
N85-22189
BALLUFFI, R. W. N85-22201
BAMFORD, R. N85-21207
BANERJEE, P. K. N85-21686
BANKS, B. A. N85-21267
BARANGER, H. U. N85-21290
BARFIELD, W. D. N85-22011
BARGER, R. L. N85-21120
BARKER, J. L. N85-21724
N85-21725
N85-21727
BARLETTA, W. A. N85-21646
BARMATZ, M. B. N85-22104
N85-22105
BARNES, C. E. N85-22200
BARNETT, C. F. N85-22121
BARRETT, H. N85-21173
BARRETT, T. B. N85-21998
N85-22145
BARRY, T. P. N85-21177
BARTOLOTTA, P. A. N85-21691
BARTOLUCCI, L. A. N85-21731
BASS, M. N85-22155
BASSETT, H. L. N85-21444
BATHE, K. J. N85-21707
N85-21708
BATLOGG, B. N85-22194
BATSON, R. M. N85-21744
BATTLES, J. E. N85-21382
BATTS, G. W. N85-21675
BAUER, G. H. N85-21790
BAUMGARDNER, J. R. N85-21663
BAXTER, L. A. N85-21706
BAXTER, L., II N85-22111
BAZUNOVA, Y. C. N85-21943
BEAUFILS, D. N85-22306
BECK, A. J. N85-21207
BECK, L. H. N85-21752
BECK, R. N85-22290
BECKER, F. N85-21112
BECKER, R. L. N85-22123
BEDFORD, A. J. N85-22162
BEDMORZ, K. N85-21782
BEHRINGER, D. N85-21785
BELKANIYA, G. S. N85-21942
N85-21946
BELLMORE, N. N85-21602
BELOZEROVA, I. N. N85-21937
BENDER, G. M. N85-21632
BENDER, L. U. N85-21739
BENNETT, K. N85-22027
BENNETT, M. J. N85-21315
BENNETT, R. H. N85-21921
BENSON, J. M. N85-21878
BENSON, S. E. N85-21681
BERBEE, H. C. P. N85-22076
BERGER, D. N85-21169
BERKOVSKAYA, M. I. N85-21941
BERLINCOURT, T. G. N85-21600
BERNDT, J. L. N85-21630
BERRY, A. D. N85-21319
BERTIN, G. N85-22262
N85-22263
BERTSEKAS, D. P. N85-22068
BESS, T. D. N85-21192
BEZMENOV, F. V. N85-21555
BHARATHAN, D. N85-21800
BIEFELD, R. M. N85-22200
BIER, R. E. N85-21522
BIERMAN, V. J., JR. N85-21831
BILEK, F. V. N85-21495
BILGER, G. N85-21790
BILIMORIA, K. D. N85-21176
BINNALL, E. P. N85-21619
BIRMINGHAM, T. J. N85-22275
BISCHOFF, K. N85-21786
BISOGNANO, J. J. N85-22118
BLACKBURN, J. F. N85-22258
BLACKMON, M. L. N85-21662
BLACKWELL, D. L. N85-21241
BLACKWELL, M. N85-21666
BLAKE, D. R. N85-21133
BLINOV, M. N85-21107
BLOCH, A. N85-21129
BLOOM, D. A. N85-21447
BLOSS, W. H. N85-21790
N85-21795
BLUME, A. E. N85-21435
BOCKRIS, J. O. N85-21300
BODO, G. N85-22310
N85-22318
BOENI, P. N85-22196
BOGORODITSKIY, Y. N85-21533
BOHAN, W. A. N85-21900
BOLLEN, W. M. N85-21643
BOLTIN, V. G. N85-21565
BOOKER, J. R. N85-21718
BORGEFALK, O. N85-21484
BORGESON, W. T. N85-21744
BORISENKOV, V. I. N85-21553
BORODIN, G. A. N85-21557
BORODIN, O. N85-21108
BOSE, S. S. N85-22181
BOTEZ, D. N85-21508
BOURKE, R. H. N85-21919
BOWMAN, J. S. N85-21988
BOWMAN, R. C., JR. N85-21336
BOXI, L. N85-21418
BOYKIN, F. M. N85-21248
BOYLE, M. J. N85-21678
BOZDOGAN, H. N85-22084
BRACH, D. N85-21189
BRADOW, F. V. N85-21908
BRAET, R. L. N85-21177
BRAGINSKI, A. I. N85-22185
BRANTLEY, G. D. N85-21180
BRAUN, M. J. N85-21569
N85-21574
BRAZEL, J. N85-21457
BRENNER, A. N85-21340
BRENNING, N. N85-22301
BRESSAN, C. N85-21397
BRICKER, R. W. N85-21675
BRILEY, W. R. N85-21582
BRINKER, D. J. N85-21261
BRINKLEY, F. W. N85-22009
N85-22125
BRINSON, H. F. N85-21271
BRITTON, K. H. N85-22024
BROCK, R. H., JR. N85-21433

BROOK, G. A. N85-22326
BROOKS, D. R. N85-21192
BROWN, D. W. N85-21840
BROWN, J. M. N85-22113
BROWN, P. W. N85-21809
N85-21816
BROWN, S. C. N85-21878
BRUCHEY, W. J. N85-21665
BRUMMER, S. B. N85-21525
BRUNEAU, M. N85-21429
BRUNEL, F. N85-22291
N85-22293
BUBENIK, D. M. N85-21470
BUCARO, J. A. N85-22142
BUCH, H. N85-21882
BUCHER, E. N85-21797
BUCKLEY, D. H. N85-21355
N85-21359
N85-21657
BUCKMASTER, J. N85-21365
BUEHLER, R. D. N85-21244
BUELL, D. N. N85-21495
BUGGELN, R. C. N85-21582
BULLARD, S. J. N85-21346
BURATI, J. L., JR. N85-21180
N85-21181
N85-21182
N85-21183
N85-21184
BURCAT, A. N85-22204
BURCHAM, R. E. N85-21569
BURNHAM, M. W. N85-21410
BURNS, S. J. N85-21713
BUROLLA, V. P. N85-21623
BURTON, D. L. N85-21851
BURWELL, R. L., JR. N85-21303
BUSCHING, H. W. N85-21181
N85-21184
BUTLER, D., III N85-22025
BUTLER, M. L. N85-21253
BUTT, J. B. N85-21303

C

CABEZUDO, C. N85-22295
CAHILL, D. F. N85-21930
CAHN, C. R. N85-21504
CAIN, E. L. N85-21468
CAIRNS, I. H. N85-22311
CALCOTE, H. F. N85-21297
CALLEN, J. D. N85-22171
CALVANI, M. N85-22307
CAMARDA, C. J. N85-21568
N85-21695
CAMMERER, F. N85-21782
CANIZARES, C. R. N85-22268
CANTRELL, J. S. N85-21336
CANTWELL, B. J. N85-21580
CARD, D. H. N85-21743
CARDAMONE, J. A. N85-21332
CAREY, R. P. N85-21676
N85-21701
CARGILL, P. J. N85-22276
CARNES, B. L. N85-21856
CARROLL, J. C. N85-21487
CARROLL, R. J. N85-21677
CARVALHO, J. A., JR. N85-21397
CASASENT, D. P. N85-21405
CASEY, T. N85-21625
CASTLE, K. R. N85-21733
CAULFIELD, J. N85-21996
N85-22145
CECH, F. N85-22271
CEREMELI, C. J. N85-21262
CERMAK, J. E. N85-21584
CERULLO, M. N85-21448
N85-21458
CHADEE, F. N85-22073
CHAGELISHVILI, G. D. N85-22285
CHAMBERS, J. L. N85-21676
CHAN, S. W. N85-22201
CHANDRA, M. N85-21485
CHANG, L. S. N85-21483
CHANG, R. K. N85-21312
CHANG, W. S. C. N85-22149
CHANNIN, D. J. N85-21508
CHAREST, K. N85-21922
CHARGEISHVILI, B. B. N85-22281
CHASE, R. N85-21620
CHAVEZ, P. S., JR. N85-21738
CHEKANOVA, S. L. N85-21939
CHEN, C. N85-21338
CHEN, C. T. A. N85-21916
CHEN, R. T. N. N85-21174
CHERNYKH, Y. V. N85-21532
CHERRY, W. D. N85-22156
CHERVINSKIY, P. P. N85-21566
CHESTUKHIN, V. V. N85-21941
CHING, J. K. S. N85-21845
CHOBOTOV, V. A. N85-21195
CHOU, L. W. N85-22212
CHOW, H. K. N85-22029
CHOW, L. S. H. N85-22169
CHOW, P. L. N85-22055
CHRISTENSEN, C. P. N85-21643
CHRISTIAN, S. D. N85-21306
CHRISTIE, W. H. N85-21624
CHRISTOPHOROU, L. G. N85-21514
CHU, T. H. N85-21483
CHUANG, S. L. N85-21438
CHUANG, T. J. N85-21294
CHUDNOVSKY, A. N85-21685
CHUDNOVSKY, D. V. N85-22059
CHUDNOVSKY, G. V. N85-22059
CHUNG, J. G. N85-21329
CICONE, R. C. N85-21736
CLANTON, U. S. N85-21202
N85-21203
CLARK, W. H. N85-21177
CLARKE, J. N85-21622
CLAUS, R. W. N85-21164
CLAWSON, A. R. N85-22176
CLEM, R. G. N85-21619
CLEMENTS, P. C. N85-22024
CLEMONS, J. M. N85-21280
CLIFF, E. M. N85-21176
CLIFF, W. C. N85-21873
CLINTON, R. G., JR. N85-22213
COCQUEREZ, J. L. N85-21110
CODY, W. J. N85-22033
COE, H. H. N85-21658
COEN, G. N85-21345
COFFEY, H. E. N85-22332
N85-22333
N85-22335
N85-22336
COHEN, J. B. N85-21303
COHEN, J. K. N85-21858
COLE, S. R. N85-21689
COLEMAN, C. F. N85-22173
COLLIN, H. L. N85-21855
COLLINS, E. R., JR. N85-21407
COLVIN, R. D. N85-21500
COLWELL, G. T. N85-21571
COLWELL, J. E. N85-21747
COLWELL, R. N. N85-21752
COMPANION, A. L. N85-21374
CONAWAY, W. E. N85-22115
COOK, R. L. N85-21314
COOPER, L. M. N85-21763
COPLEY, D. C. N85-21857
CORCORAN, E. N85-21400
COSTA, E. A. N85-21487
COTTRELL, G. A. N85-22165
COUCH, L. M. N85-21568
COUGNET, C. N85-21237
COUR-PALAIS, B. G. N85-21206
COX, C. L. N85-22050
COX, J. V. N85-21702
CRABTREE, D. J. N85-21354
CRAFT, B. D. N85-21336
CRAFT, C. M. N85-21626
CRAIG, L. J. N85-21522
CRANDALL, D. H. N85-22121
CREED, D. L. N85-21436
CREEDY, A. P. N85-21664
CREWS, J. L. N85-21200
CRIST, E. N85-21747
CRIST, E. P. N85-21736
CROALL, I. F. N85-21316
CRON, A. C. N85-21659
CRONENBERG, A. W. N85-22134
CROSBY, G. A. N85-21286
CROSLEY, D. R. N85-21292
CROUCH, R. K. N85-21651
CROUSE, D. J. N85-22214
CROWE, B. J. N85-21451
CROWLEY, J. L. N85-21143
N85-21144
N85-22147
CSONKA, P. L. N85-22215
CSPREGI, L. N85-22202
CUQINI, J. V. N85-22039
N85-22040
CUMMINGS, R. J. N85-21984
CUNNIFF, K. F. N85-21494
CURRIN, B. L. N85-22216
CUTHBERTSON, A. N85-21449
CUTKOSKY, M. R. N85-21669

D

DALBEY, W. N85-21966
DAMICO, K. L. N85-21335
DAMON, E. K. N85-22150
DANA, M. T. N85-21826
N85-21842
DANFORD, R., JR. N85-21963
DANKEL, T., JR. N85-22110
DASARI, R. R. N85-21481
DATTA, S. N85-21511
DAUGHERTY, J. R. N85-21910
DAVIS, D. N85-22043
DAVIS, E. C. N85-22136
DAVIS, E. E. N85-21208
DAVIS, L. C. N85-22111
DAVIS, L., JR. N85-22337
DAVIS, R. N85-21217
DAVIS, S. J. N85-21637
DAVIS, T. M. N85-22217
DAVOLT, J. A. N85-21507
DAWSON, G. W. N85-21833
DAWSON, L. R. N85-22200
DAY, W. B. N85-22218
DAYWITT, W. C. N85-22265
DEADMORE, D. L. N85-21321
DEAN, M. E. N85-21731
DEBNAM, W. J., JR. N85-21651
DECKER, C. E. N85-21832
DEGLORIA, S. D. N85-21752
DEGROOT, J. S. N85-21854
DEJONGH, J. N85-21104
DEJULE, R. Y. N85-22181
DEKSTER, N. D. N85-21555
DELAFONTAINE, J. N85-21247
DELJUNCO, A. N85-22093
DEMAREE, R. G. N85-22085
DEMARTINI, B. J. N85-21621
DEMHARTER, H. N85-21238
DEMIDCHIK, V. I. N85-21536
DEMIDOVICH, V. B. N85-21552
DEMORE, W. B. N85-21849
DEMPSEY, M. D. N85-21519
DEMPSEY, P. F. N85-21314
DENBOER, R. G. N85-21579
DENEF, D. E. N85-21427
DEOM, A. N85-21466
DERR, V. E. N85-21867
DESAI, T. M. N85-21530
DESPORT, J. A. N85-21315
DEVEREUX, V. G. N85-21442
DEVRIES, D. J. N85-21746
DEYCH, V. G. N85-21564
DIAMOND, W. A. N85-21569
DIBENEDETTO, E. N85-22057
DICKINSON, K. N85-21728
DIETL, J. N85-21775
DIETZE, W. N85-21777
DIKVALL, T. N85-21484
DILLER, D. E. N85-21804
DINEGAR, R. H. N85-21402
N85-21403
DINGUIRARD, M. N85-21733
DIPIPPO, R. N85-21591
DITTMAR, J. H. N85-22108
DOANE, G. B., III N85-21249
DOHERTY, L. R. N85-22269
DOI, T. N85-21578
DOMOKOS, G. N85-22207
DONGARRA, J. J. N85-22034
DONNELLY, J. P. N85-21309
N85-21310
DONNELLY, R. F. N85-22334
DOROSHEV, V. G. N85-21939
DOUGLASS, R. J. N85-22047
DOWELL, F. N85-21376
DOWLING, K. N85-21668
DOZIER, J. B. N85-22210
DRAGONETTE, L. R. N85-22106
DRAKE, M. C. N85-21313
DRESVIN, S. V. N85-21552
DROZDOVA, T. Y. N85-21951
DRUMHELLER, D. S. N85-21276
DUCKWORTH, W. H. N85-21379
DUCOTE, M. E. N85-21396
DUNN, S. A. N85-21186
DUQUETTE, D. J. N85-21329
DURFEE, R. C. N85-21764
DURNOVA, C. N. N85-21942
DURRAN, D. R. N85-21844
DYER, M. J. N85-21292
DYUFFEL, O. N85-21537
DZIUK, J., JR. N85-21365

E

EASTER, R. C. N85-21826
EASTON, G. S. N85-22086
EASTRIDGE, G. W. N85-21462
EATON, J. G. N85-21829
EBAUGH, D. R., JR. N85-21487
ECKSTROM, C. V. N85-21116
EDGECOMBE, D. S. N85-21196
N85-21218
EDMONDS, W. L. N85-22002
EDWARDS, D. N85-22066
EDWARDS, D. H. N85-21581
EINERSON, C. J. N85-21670
EL NADI, A. M. N85-22164
ELDER, J. A. N85-21930
ELFSTROM, G. M. N85-21125
ELIASON, E. M. N85-21738
ELISEEV, Y. N. N85-22298
ELLSAESSER, H. W. N85-21904
ELROD, U. N85-21797
EMSLIE, A. G. N85-22330
ENDERLE, J. D. N85-21967
ENDERLIN, W. I. N85-21712
ENGLER, C. R. N85-21388
ENSTROM, R. E. N85-21508
ENTINE, G. N85-21799
ERDOGAN, F. N85-21692
ERIKSSON, L. N85-21983
ERINGEN, A. C. N85-21709
ERSTFELD, T. E. N85-22175
N85-22177
ESPINOSA, V. E. N85-21604
ETERNO, J. N85-21173
ETTINGER, G. N85-21382
EVANS, B. T. N. N85-21641
EVANS, G. A. N85-22053
N85-22054
EVANS, J. N85-21404
EVANS, L. G. N85-21279
EWALD, R. H. N85-22006
EYDELAND, A. N85-22058
EYER, A. N85-21227
EYLON, D. N85-21318
EZRA, C. E. N85-21733

F

FACKLAM, R. L. N85-21634
FADEYEV, V. I. N85-21563
FAEHL, R. J. N85-22007
N85-22116
FAIBIS, A. N85-22122
FAIRBANKS, E. S. N85-22165
FAKHOURY, E. N85-21752
FALCONE, N. N85-21739
FARGO, L. N85-21834
FARHAT, N. H. N85-21483
FARNCOMB, R. E. N85-21370
FARRINGTON, G. C. N85-21518
FAVALORO, S. C. N85-21663
FAWLEY, W. M. N85-21646
FEDERICO, P. A. N85-22022
FEIK, R. A. N85-21151
FEITZINGER, J. V. N85-22300
FELCH, K. L. N85-21522
FELD, M. S. N85-21481
FELKEY, M. A. N85-21472
FERGUSON, C. E. N85-22263
FERLAND, K. A. N85-21230
FERRANTE, J. V. N85-21993
FERRARI, A. N85-22304
N85-22309
N85-22310
FERREIRA, J. L. G. N85-21397
FERZIGER, J. H. N85-21580
FETT, R. W. N85-21900
FIELD, E. C., JR. N85-21859
FIELD, R. D. N85-22119
FIELDER, D. N85-21219
FIELDER, W. L. N85-21358
FIELDING, J. P. N85-21175
FILTHAUT, C. N85-21794
FISCHER, N. H. N85-21196
FISCHER, R. N85-21789
FISHER, B. D. N85-21877
FISHER, E. M. N85-21771
FITZGERALD, A. N85-21729
FIX, G. J. N85-22050
FLANAGAN, J. E. N85-21392
FLEISHMAN, E. A. N85-21976
FLEMING, E. A. N85-21726
FLINT, P. O. N85-22257
FLOOD, D. J. N85-21261
FLOR, T. H. N85-21896
FODOR, G. E. N85-21289
FOGEL, A. A. N85-21611
FOHLEN, G. M. N85-21347
N85-21348
N85-21361
FOLLANSBEE, R. N85-21591
FONTENELLE, G. N85-22083
FOOS, J. S. N85-21525
FORBES, R. C. N85-22053
N85-22054
FORD, D. G. N85-21156
FORDE, E. B. N85-21921
FORMAN, G. N85-21995
FORNALIK, M. S. N85-21927
FOSTER, N. J. N85-22146
FOWLER, O. V. N85-21655
FOX, L. J. N85-21522
FOX, R. J. N85-21876
FRACASSINI, M. N85-22319
N85-22320
FRANCISCO, R. S. N85-21459
FRANK, L. J. N85-22106
FRANKE, R. N85-21705
FRANKOWSKI, I. N85-21797
FRASER-SMITH, A. C. N85-21470
FRASER, W. N85-21197
FREDD, E. H. N85-21427
FREDERICK, D. A. N85-21415
FREEDMAN, L. A. N85-21427
FREEDMAN, M. R. N85-21356
FREEMAN, L. M. N85-22210
FRENCH, K. W., JR. N85-22219
FRENCH, V. N85-21751
FREY, T. N85-21797
FREYTAG, D. R. N85-21526
FRIDOVICH, I. N85-21928
FRIEDMAN, A. J. N85-21840
FRIEZE, A. M. N85-22060
FRIPP, A. L. N85-21651
FRISCH, G. N85-21158
FRITZ, I. J. N85-22200
FROES, F. H. N85-21318
FROLOV, K. K. N85-21566
FROMHOLD, A. T. N85-22220
FUCHITA, N. N85-21885
FUCHS, A. N85-21636
FUCHS, E. N85-22088
FUHRMAN, M. N85-22152
FUHS, W. N85-21791
FUKANO, A. N85-22158
FURGAL, D. T. N85-21626
FUSCO, L. N85-21730
N85-21732

G

GABBARD, J. N85-21190
GAD-EL-HAK, M. N85-21124
GAGNEPAIN, J. J. N85-21509
GAGNON, D. R. N85-21455
GAHM, G. F. N85-22301
GALLAGHER, B. D. N85-21325
GALLAGHER, J. S. N85-21804
GAMBLE, J. D. N85-21262
GANZBURG, M. N85-21537
GAO, R. N85-21426
GARCIA, A. W. N85-21896
GARCIA, J. N85-21620
GARCIA, V. C., JR. N85-21141
GARDNER, D. E. N85-21838
GARIEPY, R. N85-22057
GARMIRE, E. N85-22155
GARNER, J. H. B. N85-21837
GATES, S. N85-21693
N85-21694
GATOS, H. C. N85-22182
GAUFFRE, G. N85-21466
GAYDUK, A. R. N85-21562
GEIGER, J. N85-21792
GEISLER, J. E. N85-21862
GELLER, M. N85-22140
GELLES, D. S. N85-21339
GEORGE, P. E., II N85-22221
GEORGE, T. G. N85-22128
N85-22129
GERSTL, S. A. W. N85-21440
N85-21638
GEVLICH, G. I. N85-21936
GHASSEMI, M. N85-21834
GHIELMETTI, A. G. N85-21855
GHOSE, H. M. N85-21264
GIBBON, J. N85-21981
GIBBS, D. N85-21335
GIBLER, D. L. N85-21148
GIGNAC, W. J. N85-22183
N85-22184
GILBERT, B. L. N85-21123
GILBODY, H. B. N85-22121
GILL, P. E. N85-22028
GILLIGAN, J. N85-22166
GINER, S. L. N85-21585
GISLER, G. R. N85-22007
GLAESE, J. R. N85-21253
GLASS, J. T. N85-21665
GLENN, M. L. N85-21346
GLICK, B. J. N85-22044
GLIMM, J. N85-21589
GLYNN, P. W. N85-22070
GNAGY, C. C. N85-21257
GODWIN, J. R. N85-21487
GOETZBERGER, A. N85-21785
GOLDBERG, R. N. N85-22208
GOLDEN, D. M. N85-21849
GOLDEN, W. G. N85-21288
GOLDENBERG, L. M. N85-21549
GOLDIE, H. N85-22156
GOLTSMAN, Y. N85-21109
GOMMERSTADT, B. N85-21685
GONSALVEZ, D. J. N85-21233
GOODENOUGH, D. G. N85-21728
GOODING, J. L. N85-21203
GOODMAN, C. E. N85-21314
GOOSSENS, M. N85-22315
GORCHINSKAYA, E. N85-21956
GORDILLO, G. N85-21795
GORDON, D. N85-21453
GORDON, S. M. N85-21988
GORDON, W. B. N85-21614
GORLAND, S. H. N85-21228
GORSHKOV, V. V. N85-21550
GORSKAYA, I. Y. N85-21559
GOTTLIEB, D. N85-22049
GOURLEY, P. L. N85-22200
GRABMEIER, B. N85-21776
GRABOWSKI, R. N85-21239
N85-21866
GRAHAM, J. A. N85-21838
GRAHAM, R. B. N85-21471
N85-21962
GRANT, W. B. N85-21631
GRAUL, R. A. N85-21179
GRAY, W. M. N85-21895
GREEN, C. E. N85-21232
GREEN, M. J. N85-22143
GREEN, T., III N85-22143
GREENBERG, J. N85-21810
N85-21813
N85-21815
GREENSPAN, E. N85-22166
GREGORY, D. C. N85-22121
GREIF, R. K. N85-21149
GREITZER, E. M. N85-21117
GRIESEMER, R. N85-21966
GRIGORYEVA, L. S. N85-21936
GRIMM, W. N85-21778
GRISNIK, S. P. N85-21259
N85-21260
GROENEBROOM, P. N85-22097
GROSSMAN, R. J. N85-21337
GROSSO, G. N85-22304
GRUBIN, H. L. N85-22186
GRUEN, E. N85-21205
GRUENINGER, H. W. N85-21789
GUBLER, U. N85-21797
GUERTIN, R. P. N85-22195
GUNSHOR, R. L. N85-21511
GUPTA, R. N. N85-21573
GUPTA, S. C. N85-21477
GUPTA, S. S. N85-22249
GURDZHIYANTS, V. N85-21107
GUREVICH, S. G. N85-21555
GURNETT, D. A. N85-22312
GURNEY, C. M. N85-21740
GUTKNECHT, W. F. N85-21832
GUYENNE, T. D. N85-22270
GVOZDEV, S. V. N85-21941
GVOZDEV, V. I. N85-21544
GYURDZHIAN, A. A. N85-21957

H

HAAKINSON, E. J. N85-21487
HAAS, W. R. N85-21399
HABER, I. N85-22120
HAFTERSON, K. J. N85-21330
HAFTKA, R. T. N85-21695
HAGIN, F. G. N85-21858
HAGIWARA, T. N85-21887
HAJDUK, B. W. N85-21995

HALE, M. N85-21104
HALES, J. M. N85-21842
HALL, J. R. N85-21743
HALL, W. B. N85-22222
HAMIL, H. F. N85-21289
HAMPSON, R. F. N85-21849
HAN, L. S. N85-21277
HANAFEE, J. E. N85-21681
HANHELA, P. J. N85-21368
HANKO, L. N85-21637
HANNA, S. R. N85-21898
HANSEN, J. N85-21871
HANSON, A. G. N85-21489
HANSON, J. N85-21457
HANSON, J. M. N85-21864
HANSSEN, A. W. N85-21905
HARABETIAN, E. N85-21990
HARDEE, H. C. N85-21803
HARDING, A. K. N85-22296
HARMER, M. P. N85-21369
HARO, M. N85-21834
HARRINGTON, R. F. N85-21473
HARRIS, R. W. N85-21654
HARTLEY, J. G. N85-21571
HASKELL, D. F. N85-22089
HAUDEN, D. N85-21509
HAWKINS, G. F. N85-22107
HAWRYLO, F. Z. N85-21635
HAWTHORNE, M. F. N85-21285
HAYWARD, R. A. N85-21445
HAZEWINKEL, M. N85-22096
HEAD, W. J. N85-21703
HEALY, V. N85-21366
HEATH, D. F. N85-22334
HECHT, H. D. N85-21782
HEDERVARI, P. N85-21869
HEEGER, A. J. N85-21375
HEFFERNAN, M. M. N85-21912
HEFFRON, M. A. N85-21993
HEFFTER, J. L. N85-21839
HEGDAL, L. N85-21165
HEGG, D. A. N85-21914
HEISER, W. N85-21104
HELD, V. N85-21145
HELLER, M. N85-21156
N85-21676
N85-21698
HELMICK, C. N., JR. N85-21452
HELMREICH, D. N85-21774
HENDERSON, D. M. N85-21497
HENDERSON, M. A. N85-21291
HENDRICKS, R. C. N85-21569
N85-21574
HENDRICKSON, E. M. N85-21717
HENKE, B. L. N85-22099
HENNESSY, R. T. N85-22248
HENRICH, V. E. N85-21312
HERBELL, T. P. N85-21356
HERMANS, D. N85-22315
HERSEY, J. B. N85-22111
HERSHBERG, E. L. N85-21714
HESS, C. F. N85-21604
HESTER, C. F. N85-21405
HEWIG, G. H. N85-21793
HEWITT, R. L. N85-21153
HEYMAN, J. S. N85-21441
HEYWOOD, H. C. N85-22325
HEZEL, R. N85-21784
HIBBS, S. N85-21521
HIEBERT, A. I. N85-21216
HIGUCHI, N. N85-22191
HILL, C. K. N85-21875
HINDSON, W. S. N85-21174
HINKLEY, E. D., JR. N85-21631
HINSON, D. P. N85-22327
HIRAO, J. N85-21229
HIRAO, K. N85-21255
HITSUMA, M. N85-21892
HIVELY, L. M. N85-22168
HIZAL, A. N85-21449
HO, W. W. N85-21304
HOAGLAND, R. N85-21328
HOBART, H. F. N85-21605
HOBBS, P. V. N85-21914
HOCHHEIMER, B. F. N85-21965
HOCHULI, U. N85-21640
HOCK, V. N85-21366
HODGES, T. N85-21748
N85-21749
N85-21750
N85-21751
HOFF, H. A. N85-21333
HOFFMAN, J. H. N85-21242
HOGG, D. C. N85-21529
HOLDEMAN, J. D. N85-21872
HOLDEN, M. S. N85-21587
HOLDREN, M. W. N85-21836
HOLLE, R. L. N85-21910
HOLLENBECK, K. N85-21463
HOLM, R. G. N85-21733
HOLMES, B. J. N85-21118
HOLST, D. N85-21475
HOLT, S. N85-21807
HOMICZ, G. F. N85-21586
HONG, S. K. N85-21572
HONRUBIA, J. J. N85-22295
HOOD, A. W. N85-22276
HOOPER, S. L. N85-21595
HOOTS, L. C. N85-21469
HOOVER, W. G. N85-21715
HOPKINS, D. N85-21646
HOPKINS, D. A. N85-21273
HORST, T. W. N85-21843
HORVATH, R. L. N85-21654
HOSSI, H. N85-21682
HOVIS, W. A. N85-21734
HOVLAND, D. N85-21894
HOWARD, C. J. N85-21849
HOWARD, J. F. N85-21763
HOWELL, W. C. N85-22063
N85-22250
HRUBY, J. M. N85-21623
HSIA, Y. N85-21170
HSIEH, C. N85-21620
HSIEH, M. Y. N85-21461
HSU, W. L. N85-21521
HU, T. C. J. N85-21577
HUA, K. A. N85-21997
HUANG, F. H. N85-21339
HUANG, G. N85-21422
HUBBELL, T. E., JR. N85-21324
HUBER, P. S. N85-21927
HUDDLESTON, G. K. N85-21450
HUDSON, B. N85-21317
HUERTA, M. A. N85-21516
HUEY, H. E. N85-21522
HUIJIANG, W. N85-21418
HULL, J. A. N85-21489
HUMES, D. H. N85-21192
HUMPHREY, P. T. N85-21137
HUNG, S. C. N85-21272
HUNOLD, K. N85-21779
HUNT, J. J. N85-22270
HUNTER, S. R. N85-21514
HUSBAND, S. H. N85-21230
HUSSAINI, M. Y. N85-21575
HUSSLA, I. N85-21287
N85-21295
HUST, J. G. N85-21311
N85-21381
HWANG, J. C. M. N85-22181
HWANG, S. Y. N85-21690
HYMAN, E. B. N85-21899
HYMAN, J. M. N85-22052
HYMER, W. C. N85-21923
HYSLOP, J. N85-22053
N85-22054
HYUN, J. M. N85-22223

I

ICHIKI, A. N85-21888
N85-21889
IGLEHART, D. L. N85-22070
ILIN, O. P. N85-21561
ILIN, Y. M. N85-21560
INGE, T., B. N85-21906
INGEBO, R. D. N85-21570
IRION, C. E. N85-21163
ISELBORN, S. N85-21792
ISHII, K. N85-22160
ISHIKAWA, M. N85-22158
ISSELSTEIN, F. N85-21345
IVANOV, K. V. N85-21539
IVANOV, V. A. N85-21557

J

JACKSON, D. R. N85-21517
JACKSON, R. D. N85-21733
JACQUET, P. N85-21169
JAEGER, D. A. N85-21265
JAGGARD, D. N85-21483
JAMES, L. R. N85-22085
JANECKE, J. N85-21625
JANICKI, A. J. N85-21371
JANK, T. N85-22035
JANOCKO, M. A. N85-22185
JANSSENS, R. N85-21625
JANZEN, H. W. N85-21345
JARECKI, L. N85-22179
JARGON, F. N85-21672
JARRETT, B. R. N85-21501
JASPER, G. N85-21875
JASPERSON, W. H. N85-21872
JAYANTY, R. K. M. N85-21832
JEFFRIES, W. R., III N85-21878
JEMIAN, W. A. N85-22224
JENSEN, G. N85-21185
JESCHAR, R. N85-21411
JIA, R. Q. N85-22092
JIMBO, K. N85-22159
JOHNSON, D. L. N85-21875
JOHNSON, D. W. N85-21821
JOHNSON, G. B. N85-21503
JOHNSON, K. I. N85-21761
JOHNSON, M. N85-22021
JOHNSON, R. G. N85-21855
JOHNSON, R. W. N85-21583
JOHNSON, T. J. N85-21286
JOHNSON, T. R. N85-22169
JOHNSON, W. S. N85-21270
JOHNSTON, A. R. N85-22139
JOHNSTON, J. P. N85-21580
JONAS, F. M. N85-21615
JONES, A. F. N85-21230
JONES, D. J. N85-21696
JONES, G. W. N85-21139
JONES, L. E. N85-21391
N85-21394
JONES, O. D. N85-21739
JONES, R. N85-21676
N85-21698
JONES, R. E. N85-21168
JONES, V. L. N85-21253
JONES, W. R., JR. N85-21357
JORGENSEN, G. J. N85-21770
JORY, H. R. N85-21522
JOSEPH, J. N85-21528
JOST, G. S. N85-21700
N85-21701
JOU, W. H. N85-21126
JOY, E. B. N85-21446
JUNG, J. N85-22166
JUSTICE, C. N85-21730

K

KAASE, H. N85-21786
KADABA, P. K. N85-22225
KAIJIA, C. N85-21419
KALITA, N. F. N85-21935
KALKOFEN, W. N85-22310
KALSHOVEN, J. E., JR. N85-21639
KAMENSKIY, Y. N. N85-21940
KAMGAR-PARSI, B. N85-21804
KAMITAKAHARA, W. A. N85-22196
KAMPER, R. A. N85-21486
KANADE, T. N85-22152
KANE, R. J. N85-21521
KANTER, E. P. N85-22122
KAPLAN, M. H. N85-21212
KAPLANSKIY, A. S. N85-21942
KARAGULLA, H. N85-21673
KARAKI, S. N85-21798
KARAMCHETI, K. N85-21170
KARR, G. R. N85-22210
KARTASHYAN, V. O. N85-21563
KASTNER, C. J. N85-21733
KASYAN, L. I. N85-21932
KATKOW, V. Y. N85-21941
KAUFMAN, A. N85-21690
KAUFMAN, A. A. N85-21920
KAUTH, R. J. N85-21747
KAWAHATA, K. N85-22172
KAWAMURA, S. N85-21229
KAWASHIMA, N. N85-21229
KAWASUMI, Y. N85-22172
KAYE, M. N85-22151
KEARSLEY, E. A. N85-21373
KECK, R. N85-21345
KEDIYA, T. G. N85-21941
KEHOE, A. N85-21592
KEISER, G. M. N85-21608
KELLER, G. V. N85-21920
KELLER, T. M. N85-21353
KELLEY, H. J. N85-21176
KELLY, M. D. N85-22205
KELLY, S. N85-21979
KELLY, S. G. N85-21588
KENDALL, B. R. F. N85-21250
KEPPNER, H. N85-21797
KERR, R. G. N85-21521
KERSLAKE, W. R. N85-21258
KESSLER, D. J. N85-21188
N85-21191

N85-21193
N85-21194
N85-21204
N85-21220
KESTIN, J. N85-21591
KEUNINGS, R. N85-21590
KHESTANOV, R. K. N85-21532
KIDD, S. Q. N85-21412
KIEFFER, H. H. N85-21738
KIM, C. N85-21706
KIM, S. N85-22183
N85-22187
KIMMERLE, J. N85-21795
KINDLE, C. H. N85-21617
KINNEY, R. B. N85-21272
KINSEY, J. L. N85-21161
KIRALY, P. N85-22287
KIRILLOV, V. Y. N85-21543
KIRILLOVA, Z. A. N85-21939
KIRK, D. C. N85-21482
KIRK, F. C. N85-21338
KIRKPATRICK, M. I. N85-22121
KIRSTEN, F. A. N85-21619
KISER, J. D. N85-21356
N85-21674
KITTERMAN, J. H. N85-22226
KITTLESON, J. K. N85-21112
KLAMUT, C. J. N85-22191
KLEIN, G. N85-21380
N85-21510
N85-22046
KLEIN, R. I. N85-22322
KLEMA, V. N85-21999
KLEMENS, W. N85-21408
KLIMAS, P. C. N85-21128
KLINE, K. E. N85-21486
KLINE, S. J. N85-21580
KLINGENBERG, C. N85-21589
KLOSTER, G. V. N85-21139
KLUBNIKIN, V. S. N85-21554
KNIFFLER, N. N85-21788
KNIGHT, D. R. N85-21988
KNOBLER, C. B. N85-21285
KNOLL, K. R. N85-21262
KNYAZEV, V. M. N85-21952
KO, B. H. N85-21594
KO, W. L. N85-21245
KOCHAROV, G. E. N85-22277
KOENIG, T. N85-22227
KOENING, W. N85-22122
KOEVESI-DOMOKOS, S. N85-22207
KOGUT, J. N85-21742
KOHLER, R. R. N85-21612
KOHN, R. V. N85-21704
N85-22063
KOK, J. N85-22036
KOKOREVA, L. V. N85-21955
KOLASINSKI, W. A. N85-21236
KOLATA, J. N85-21625
KOLLIE, T. G. N85-21624
KOMAR, C. A. N85-21763
KORB, C. L. N85-21639
KORICHEV, A. A. N85-21566
KORNECKI, A. N85-21688
KORNFELD, D. M. N85-21187
KOROLKOV, V. I. N85-21952
KORUPP, K. H. N85-21781
KOSCIELNY, G. N85-21781
KOSMAL, B. A. N85-21656
KOURTIDES, D. A. N85-21362
N85-21364
KOVAR, D. N85-21625
KOWALCZYK, S. P. N85-22184
KOWALSKI, R. N85-21209
KOWGER, H. V. N85-21508
KOZLOV, I. A. N85-21545
KOZLOVSKAYA, I. R. N85-21936
KRAFT, M. N85-21812
KRAMER, P. A. N85-21244
KRAVCHUK, A. N. N85-21948
KRAVITZ, M. N85-21427
KREIDER, K. G. N85-21607
KRESKOVSKY, J. P. N85-22186
KRESS, L. W. N85-21837
KRISHNAIAH, P. R. N85-22085
KROLEWSKI, S. N85-21173
KROTHAPALLI, A. N85-21170
KROTOV, V. P. N85-21943
KRUEHLER, W. W. N85-21787
KRUPKE, W. F. N85-21647
KUEHL, K. N85-22202
KUESSNER, H. G. N85-21111
KUKUSHKIN, Y. A. N85-21947
KULAYEV, B. S. N85-21943
KULIKOV, S. P. N85-21559
KULIKOV, V. A. N85-21535
KUMAR, A. N85-21366
KUNIMATSU, K. N85-21288
KUNZ, P. D. N85-22135
KUO, Y. S. N85-21650
KUPERMAN, G. G. N85-21601
KURODA, T. N85-22191
KURTH, W. S. N85-22312
KURYLO, M. J. N85-21849
KUSAKA, T. N85-21359
KUSTOV, V. V. N85-21947
KUSUNOSE, M. N85-22297
KUZMIN, L. A. N85-21553

L

LABUN, P. A. N85-21315
LACIS, A. N85-21671
LAFREY, R. R. N85-21136
LAGAKOS, N. N85-22142
LAGOWSKI, J. N85-22182
LAKIN, K. M. N85-21603
LAKIN, W. D. N85-22051
LAM, N. Q. N85-21333
LAMB, R. G. N85-21844
LAMBERT, D. N. N85-21921
LAMPO, R. N85-21366
LAMPSON, A. I. N85-21633
LANGE, C. B. N85-21926
LANGHAMMER, H. J. N85-21672
LANGLEY, P. N85-22045
LANKFORD, A. B. N85-21311
LANSING, J. C. N85-21727
LANZ, T. N85-21773
LAOULACHE, R. N. N85-21591
LAPOVOK, Y. S. N85-21538
LARDUINAT, E. N85-21742
LARRABEE, J. N85-21748
N85-21749
N85-21750
LARSEN, D. C. N85-21367
LARSON, G. W. N85-21172
LASSAHN, G. D. N85-22114
LATSKEVICH, A. A. N85-21933
LAUCHLE, G. C. N85-21585
LAUDERBAUGH, L. K. N85-22041
LAUER, D. T. N85-21757
LAUER, J. L. N85-21357
LAURENCE, C. L. N85-21808
LAURENCE, J. A. N85-21837
LAURIN, R. N85-21747
LAUVER, R. W. N85-21350
N85-21351
N85-21352
LAWRENCE, D. J. N85-21703
LAWRENCE, J. D. N85-22259
LAWTON, D. T. N85-22148
LAYTON, D. H. N85-21487
LEAVENS, C. R. N85-21290
LEBOZEC, A. N85-21110
LECHNER, W. N85-21146
LECROY, S. R. N85-21874
LEDBETTER, F. E., III N85-21280
LEDUC, S. N85-21751
LEE, B. N85-22181
LEE, B. H. K. N85-21121
N85-21696
LEE, C. H. N85-22061
LEE, C. S. N85-21438
LEE, R. N. N85-21842
N85-21843
LEE, S. S. N85-21673
LEE, S. W. N85-21436
LEE, S. Y. N85-22124
LEE, W. E. N85-21172
LEETMAA, A. N85-21765
LEIMER, D. K. N85-21504
LEISTE, H. N85-21227
LENKE, L. R. N85-21179
LEONARD, L. N85-21185
LEONARD, R. L. N85-21230
LEPKOWSKI, T. R. N85-22181
LESTRADIC, B. N85-21237
LETSON, K. N. N85-21465
LEVELT-SENGERS, J. M. H. N85-21804
LEVI-SETTI, R. N85-21616
LEVIS, C. A. N85-21233
LEWIS, E. N., JR. N85-21172
LHAGWA, L. N85-21934
LI, C. P. N85-21282
LI, C. Y. N85-22199
LILLEY, D. G. N85-21167
LIN, C. C. N85-22283
N85-22284
LIN, L. S. N85-21504
LIN, S. N85-22001
LINCE, J. R. N85-22183
LINDBERG, R. G. N85-21827
LINDHOLM, K. N85-21527
LIPPMANN, B. A. N85-22117
LIPPS, F. W. N85-21808
LISTER, P. N85-21625
LITAU, V. G. N85-21947
LITTLE, G. A. N85-22022
LITVINENKO, M. Y. N85-21544
LIU, F. N85-21374
LO, Y. T. N85-21438
LOCK, S. N85-21966
LOCKHART, R. A. N85-22062
LOEWY, R. G. N85-21266
LOF, G. O. N85-21796
LOMINADZE, J. G. N85-22260
N85-22285
LONDERGAN, R. N85-21835
LONG, R. K. N85-22150
LOOZE, D. P. N85-21173
LOPEZ, N. N85-21522
LOPEZ, R. E. N85-21910
LOSCUTOFF, S. M. N85-21836
LOTTATI, I. N85-21688
LOW, B. C. N85-22313
LOW, T. S. N85-22181
LOWE, D. R. N85-21479
LOWE, S. A. N85-22283
LUDTKA, G. M. N85-21624
LUEBCKE, E. H. N85-21966
LUENEBURG, E. N85-21485
LUHN, E. N85-21345
LUNDGREN, C. N85-21964
LUNDIEN, J. R. N85-21856
LUSK, E. L. N85-22016
LUST, R. V. N85-21150
LUX-STEINER, M. C. N85-21797
LYON, R. W. N85-21449

M

MACDONALD, A. H. N85-21290
MACDORAN, P. F. N85-21846
MACHIN, A. S. N85-21152
N85-21699
MACK, G. N85-22260
MACLENNAN, B. J. N85-22020
MACLEOD, W. D., JR. N85-21840
MAEDA, C. N85-21359
MAEDER, P. F. N85-21591
MAFFLY, D. H. N85-22022
MAGNON, A. N85-22303
MAID, O. N85-21342
MAIER, J. J. N85-21993
MAILHE, C. C. N85-21305
MAJKRZAK, C. F. N85-22194
MAKAROV, G. F. N85-21932
MALARET, E. N85-21741
MALEVSKAYA-MALEVICH, N. A. N85-21948
MALIK, S. N85-21166
MALILA, W. A. N85-21735
MALKAN, M. A. N85-22268
MALL, S. N85-21270
MALONE, R. C. N85-21962
MANCA, J. N85-21522
MANN, J. Y. N85-21152
MAPLE, M. B. N85-22195
MARIA N85-21341
MARR, D. R. N85-22009
N85-22125
MARRON, J. S. N85-22058
MARSCH, E. N85-22273
MARSH, G. P. N85-21318
MARSHALL, R. N85-21998
N85-22145
MARSIK, S. J. N85-21231
MARTELLO, N. N85-21925
MARTI, J. N85-22023
MARTI, K. N85-22086
MARTIN, C. H. N85-21233
MARTIN, J. F. N85-21808
MARTIN, J. W. N85-21717
MARTIN, R. D. N85-22081
N85-22082
MARTINEZ-VAL, J. M. N85-22295
MARXER, H. N85-21357
MASAK, R. J. N85-21434
MASE, H. N85-22160
MASON, F. C. N85-22228
MASSAGLIA, S. N85-22310
MATHEWSON, M. N85-21907
MATJE, P. N85-21779
MATROSOVA, M. A. N85-21939
MATSUOKA, K. N85-22172
MATTINGLY, J. D. N85-21615

MATYUSHKIN, B. D. N85-21549
MAUTZ, J. R. N85-21473
MAYNES, O. N85-21840
MAYO, F. R. N85-21401
MCANULTY, M. A. N85-22229
MCBRIDE, B. J. N85-21166
N85-22204
MCBRYAN, O. N85-21589
MCCANDLESS, B., II N85-21649
MCCARTHY, J. N85-22259
MCCAULEY, R. W. N85-21621
MCCROSKEY, W. J. N85-21113
MCDANIEL, E. W. N85-22121
MCDONALD, G. C. N85-22249
MCDONALD, H. N85-21582
MCDONALD, M. W. N85-22230
MCGILLEM, C. D. N85-21741
MCGIRT, F. N85-22010
N85-22012
N85-22013
N85-22015
MCHUGH, J. N85-22017
MCILWAIN, M. E. N85-21670
MCINERNEY, M. K. N85-21850
MCINTOSH, A. C. N85-21282
MCINTYRE, D. N85-21386
MCKEEN, R. G. N85-21179
MCKINLEY, J. B. N85-21881
MCKNIGHT, R. H. N85-22121
MCLAUGHLIN, P. V., JR. N85-21155
MCLEAN, D. N85-21154
MCLEARY, R. N85-21644
MCMULLEN, T. B. N85-21836
MCMULLIN, P. G. N85-21515
MCNEESE, J. A. N85-21833
MCNUTT, R. L. N85-22274
MCQUEEN, R. G. N85-22113
MEAD, G. N85-21839
MEADER, M. W. N85-21841
MEHL, W. N85-21730
N85-21732
MEISNER, G. P. N85-22195
MELCHIOR, B. N85-21783
MELIKIDZE, G. I. N85-22280
MELL, H. N85-21791
MELNGAILIS, J. N85-22153
MENDE, S. B. N85-21240
MENG, X. Z. N85-21175
MENNER, R. N85-21795
MENON, P. K. A. N85-21176
MENZEL, D. B. N85-21838
MERCER, B. W. N85-21833
MERTZ, F. C. N85-21743
MESTEL, L. N85-22279
METCALFE, R. W. N85-21126
METZDORF, J. N85-21786
METZLER, M. D. N85-21735
MEWALDT, R. A. N85-22337
MEYER, A. E. N85-21927
MEYER, F. P. N85-21460
MEYER, F. W. N85-22121
MEYYAPPAN, M. N85-22186
MEZDROGINA, M. M. N85-21611
MICHALEC, A. N85-22299
MICHALSKY, J. J. N85-21630
MIGLIUOLO, S. N85-22276
MIKHAYLOV, V. M. N85-21938
MIKKELSEN, D. R. N85-22168
MIKROYANNIDIS, J. A. N85-21362
N85-21363
N85-21364
MILES, M. J. N85-21488
MILEY, G. H. N85-22166
MILEY, G. K. N85-22267
MILEY, S. J. N85-21119
MILLER, C. L. N85-22022
MILLER, D. F. N85-21235
MILLER, H. C. N85-22101
MILLER, J. G. N85-21269
MILLER, K. N85-21158
MILLER, N. R. N85-22254
MILLER, R. L. N85-21912
MILLER, S. M. N85-21668
N85-21980
MILLS, B. E. N85-21521
MILYKH, M. M. N85-21548
MILYUKOV, I. N85-21533
MINGUEZ, E. N85-22295
MINTS, S. V. N85-21560
MIRCHANDANI, M. G. N85-21155
MIRONOVA, T. V. N85-21545
MIROSHNIKOVA, Y. B. N85-21937
MITATE, Y. N85-21892
MITCHELL, A. N85-21409
MIURA, K. N85-21697
MIYOSHI, K. N85-21355
N85-21359
MIZERA, P. F. N85-21236
MIZUHARA, H. N85-21461
MOBLEY, C. N85-21328
MOELLER, B. N85-22000
MOFFAT, R. J. N85-21580
MOHRING, H. D. N85-21790
MOLINA, M. J. N85-21849
MONCTON, D. E. N85-21335
MONK, D. L. N85-21472
MOORADIAN, G. C. N85-21281
MOORE, C. E. N85-21456
MOORE, F. K. N85-21117
MOORE, I. D. N85-21718
MOORE, K. N85-22010
MOORE, R. L. N85-22268
MOOS, H. W. N85-22170
MORAN, B. N85-21715
MOREA, S. F. N85-21231
MORGAN, D. L. N85-21838
MORGAN, F. W. N85-21180
MORGAN, T. H. N85-21199
MORGAN, T. J. N85-22121
MORGENTHALER, S. N85-22087
MORLEY, B. M. N85-21845
MORRISON, A. D. N85-22178
MORRISON, B. J. N85-22186
MORRISON, G. N85-21804
MORRISON, M. A. N85-22126
MORRISON, R. J. S. N85-22115
MOSHER, R. N85-21762
MOSS, J. N. N85-21573
MOSTYKO, V. S. N85-21539
MOSYAKINA, L. I. N85-21948
MOUNT, D. I. N85-21830
MOY, L. N85-21799
MROZ, E. J. N85-21903
MUAMMAR, R. N85-21477
MUECK, G. N85-21788
MUELLER, A. C. N85-21213
MUELLER, W. N85-21792
MUESCHENBORN, W. N85-21342
MUI, P. C. N85-21513
MULAIK, S. A. N85-22085
MULARZ, E. J. N85-21164
MULLEN, J. G. N85-21627
MULLEN, P. G. N85-21428
MULLEN, R. L. N85-21569
N85-21574
MUNZ, P. N85-21797
MURAVYEV, S. I. N85-21546
MURIN, P. J. N85-21230
MURPHY, C. E., JR. N85-21825
MURPHY, J. N85-21729
MURPHY, O. J. N85-21300
MURPHY, R. J. N85-22278
MURRAY, S. S. N85-22266
MURRAY, W. N85-22028
MURTHY, P. K. N85-22151
MYERS, D. M. N85-21163
MYERS, D. R. N85-22200

N

NAGAI, T. N85-21890
NAGY, K. N85-21262
NAIL, K., JR. N85-22339
NAKAJIMA, H. N85-22293
NAKAZAWA, K. N85-21255
NAKAZAWA, S. N85-21686
NARAYAN, J. N85-22193
NEBEL, C. E. N85-21790
NEIL, V. K. N85-21646
NELSON, D. J. N85-21526
NELSON, J. G. N85-22183
N85-22187
NEPVEU, M. N85-22308
NERNEY, S. N85-22231
NESTE, S. L. N85-21196
NEUGEBAUER, G. N85-22267
NEUHAEUSSER, G. N85-21781
NEWMAN, B. A. N85-21602
NEWMAN, L. N85-21822
N85-21823
NIAIOL, T. N85-21911
NICOLAENKO, B. N85-22072
NIEDENZU, K. N85-21374
NIEDERDELLMANN, G. N85-21828
NIEHOFF, R. N85-22260
NIEMANN, E. N85-21789
NIEMELAE, I. N85-21682
NIESSL, R. N85-22202
NIEVA, V. F. N85-21978
NIGHAN, W. L. N85-21506
NIGHTINGALE, R. W. N85-21252
NIKITIN, S. A. N85-21226
NIKITOPOULOS, D. E. N85-21591
NIKOLAYENKO, E. M. N85-21941
NISHIDA, Y. N85-22160
NITZAN, A. N85-21296
NNAJI, S. N85-21183
N85-21184
NOBILI, L. N85-22307
NODA, N. N85-22172
NOE, K. A. N85-21283
NOLA, F. J. N85-21769
NOMURA, Y. N85-22157
NOONAN, R. E. N85-22003
NORGREN, C. T. N85-21115
NORRIS, D. M. N85-21715
NORSTEN, J. J. N85-21579
NTAGWIRUMUGARA, E. N85-22071
NUMRICH, S. K. N85-22106
NUSSBAUM, D. S. N85-21960

O

OBARA, C. J. N85-21118
OBERHOF, D. N85-21345
OCANA, J. L. N85-22295
OCDRURY, L. N85-22290
OCONNOR, D. N85-21995
ODELL, R. D. N85-22009
OEHLKERS, R. A. N85-21876
OFFICER, C. B., JR. N85-22111
OGASAWARA, M. N85-22158
OGAWA, I. N85-22172
OGAWA, Y. N85-22172
OHAYON, R. N85-21684
OHKUBO, K. N85-22172
OHSAWA, Y. N85-22161
OKEEFE, M. A. N85-22190
OLMSTEAD, D. N85-21215
OLSEN, G. H. N85-21508
OLSON, C. N85-21607
OLSON, D. B. N85-21297
OLSON, J. M. N85-21760
ONEILL, H. J. N85-21988
ONYSHKO, A. G. N85-21551
OREILLY, F. J. N85-22062
ORTWERTH, P. J. N85-21633
ORZECHOWSKI, T. J. N85-21646
OSBORN, T. L. N85-22210
OSHIMA, R. N85-21837
OSTERYOUNG, J. G. N85-21284
OSTERYOUNG, R. A. N85-21284
OTT, M. S. N85-21677
OVERBEEK, R. A. N85-22016
OVERFELT, P. L. N85-21447
OVERTON, J. H., JR. N85-21838
OYAMA, K. N85-21255

P

PAASCHE, S. M. N85-21790
PACE, M. E. N85-21762
PAE, K. D. N85-21602
PAFFENHOFER, G. A. N85-21929
PAGE, R. E. N85-21599
PAIZIS, C. N85-22314
PALMER, J. M. N85-21733
N85-21756
PALMER, R. N85-22102
PANDEY, D. K. N85-21606
PANOVA, E. M. N85-21958
PARDO, R. N85-21625
PARK, E. Y. N85-21354
PARK, F. W. N85-21619
PARK, W. N85-21729
PARKER, J. A. N85-21347
N85-21348
N85-21361
PARKER, M. A. N85-21443
PARNAS, D. L. N85-22024
PARTHASARATHY, S. P. N85-21597
PARZEN, G. N85-22192
PASINETTI, L. E. N85-22319
N85-22320
PATARAYA, A. D. N85-22281
PATERNOSTER, R. R. N85-22008
PATHARE, V. N85-21322
PAUL, A. C. N85-21646
PAUL, D. B. N85-21368
PAUL, J. N85-21676
PAUL, J. F. N85-21831
PAULSON, R. M. N85-21474
PAYNE, J. C. N85-21122
PEARCE, R. W. N85-21840
PEIYU, Y. N85-21417
PELL, E. N85-21837

PELL, R. A. N85-21152
PELLAT, R. N85-22306
PELLETIER, G. N85-22305
PEMSLER, J. P. N85-21519
PENKO, P. F. N85-21259
PENN, B. G. N85-21280
PENNYCOCK, S. J. N85-22193
PERBOS, J. L. N85-21237
PERKINS, M. M. N85-21680
PERKOV, V. V. N85-21547
PERLADO, J. M. N85-22295
PEROUTKA, M. R. N85-21908
N85-21909
PERRIGO, L. N85-21185
PERRING, S. N85-21317
PERROTTI, H. P. N85-21913
PERRY, J. L. N85-21609
PERSICKE, H. N85-21780
PETERSEIM, J. N85-21344
PETERSEN, H. N85-21826
PETROVA, L. N. N85-21952
PETTITT, A. N. N85-22077
N85-22078
N85-22079
N85-22080
N85-22081
PEYSAKHOVICH, L. V. N85-21565
PFISTERER, F. N85-21795
PHANEUF, R. A. N85-22121
PHILLIPPI, H. M. N85-21703
PHILLIPS, M. D. N85-21139
PHILLIPS, S. D. N85-21286
PHILLIPS, S. L. N85-21619
PHILPOTT, M. R. N85-21288
N85-21294
PIAN, T. H. H. N85-21165
N85-21687
PIERCE, D. D. N85-21617
PIERRET, R. F. N85-21511
PIERSON, W. J., JR. N85-21753
PINEAULT, S. N85-22317
PINNOW, D. A. N85-21497
PITCHER, E. J. N85-21882
PLAETTNER, R. D. N85-21787
PLIMPTON, G. N85-21448
N85-21458
PLIS, A. I. N85-21567
PLOHR, B. N85-21589
PODNAR, G. N85-21666
PODWYSOCKI, M. H. N85-21739
POEDTS, S. N85-22315
POLEVODOV, B. S. N85-21552
POLIKARPOV, N. A. N85-21953
POLITZER, P. N85-21298
POLLAK, M. N85-22100
POLLOCK, W. J. N85-21326
POLYAK, M. N. N85-21549
POMETOV, Y. D. N85-21938
POOL, K. H. N85-21617
POPOV, I. G. N85-21933
POPOV, V. I. N85-21942
POPOVA, I. A. N85-21951
POREH, M. N85-21584
POSTYUSHKOV, V. P. N85-21551
POTTER, A. E. N85-21222
POTTER, T. F. N85-21378
POULSEN, P. N85-21521
POYNTER, R. L. N85-22312
PRATT, T. W. N85-22004
PRAVOSUDOV, V. P. N85-21945
PRIDDY, T. G. N85-21618
PRIMSHITS, P. P. N85-21561
PRINCE, S. N85-21399
PRINCE, T. A. N85-22337
PROCTOR, B. L. N85-21242
PROSNITZ, D. N85-21646
PROUTY, D. N85-21504
PUNNETT, M. B. N85-21446
PUPKO, B. N85-21453
PYLE, R. V. N85-22167

Q

QIAN, M. N85-21421
QIKE, F. N85-21419
QUINLAN, K. P. N85-22177
QUINN, G. D. N85-21460
QUINN, J. M. N85-21252

R

RACCAH, P. M. N85-21314
RADHAKRISHNAN, K. N85-21162
RAFFAELLI, G. N85-22319
RAHN, H. N85-21964
RAMATAY, R. N85-22278
RAND, J. L. N85-21598
RANKEN, W. A. N85-22134
RANKIN, J. G. N85-21210
RANZINGER, M. N85-22019
RAPHAELIAN, L. A. N85-21382
RAPP, R. N85-21328
RASCH, G. E. N85-21907
RASKE, D. T. N85-21382
RATNER, M. A. N85-21296
RAUB, J. A. N85-21838
RAVISHANKARA, A. R. N85-21849
RAWLIN, V. K. N85-21256
RAY, P. K. N85-21662
RAZINKIN, S. M. N85-21947
RECCHETTI, F. N85-21625
REDDY, J. N. N85-21719
N85-21720
REDDY, V. R. N85-21613
REED, D. A. N85-21717
REED, L. N85-21615
REEDER, B. C. N85-21813
REGENHARDT, P. A. N85-22031
REGNIERT, P. G. N85-21333
REHRL, M. N85-21463
REID, F. M. H. N85-21926
REID, L. E. N85-21844
REID, R. C. N85-21262
REILLY, C. H. N85-21233
REIMANN, K. J. N85-21628
REINERT, R. N85-21837
REINIS, S. N85-21960
REITER, E. R. N85-21847
REMBETSY, L. S. N85-21525
REMEIKA, J. N85-22194
RENNE, D. S. N85-21873
RENTROP, P. N85-22048
REPOFF, T. P. N85-22334
RESHETNIKOV, O. M. N85-21532
REUSS, M. L., JR. N85-21499
REYNOLDS, R. C. N85-21196
REYNOLDS, W. N. N85-21317
RHOADS, S. C. N85-21346
RHODES, W. H. N85-21464
RICHTER, D. D. N85-21821
RICHTER, H. N85-21796
RICKERT, H. N85-21794
RICKUS, E. N85-21796
RIDD, M. K. N85-21754
RIDDLEBAUGH, S. M. N85-21115
RIECK, A. N85-21978
RIEKE, R. D. N85-21331
RIND, D. N85-21871
RISNER, S. P. N85-21465
RITTER, P. R. N85-21752
ROBBERTO, M. N85-22302
ROBERTS, B. B. N85-21201
N85-21262
ROBERTS, J. B. N85-21193
ROBERTUS, R. J. N85-21617
ROBINSON, A. P. N85-21430
ROBINSON, D. N. N85-21691
ROBSON, D. N85-22137
RODEMAN, R. N85-21618
RODMAN, B. K. N85-21390
N85-21393
N85-21395
ROE, J. N85-21694
ROFFER, C. N85-21765
ROGERS, W. A. N85-21512
ROMAN, R. F. N85-21256
RONCHETTI, E. N85-22066
ROPE, E. L. N85-21445
ROSE, J. N85-21507
ROSENBLATT, M. N85-22067
ROSENFIELD, A. R. N85-21379
ROSENTHAL, J. N85-21900
ROSNER, R. N85-22310
ROSSI, B. N85-22272
ROST, E. N85-22135
ROTACH, V. Y. N85-21562
ROTH, D. J. N85-21674
ROTHENBERG, C. N85-21502
ROUSSOS, L. A. N85-22109
ROWLETTE, J. J. N85-21596
ROY, K. N85-21781
RUBESIN, M. W. N85-21572
RUBTSOV, S. A. N85-21550
RUCK, B. N85-21648
RUDNER, S. N85-21527
RUDOLPH, D. J. N85-22063
RUEBEL, H. N85-21792
RUEDEN, J. P. N85-21876
RUSSELL, G. N85-21871
RUSTAMYAN, O. N. N85-21949
RUTH, D. P. N85-21912
RUTH, R. D. N85-22127
RYABTSOV, A. L. N85-21541
RYAN, D. P. N85-21309
N85-21310

S

SACHS, D. N85-21490
SAINTAUBERT, P. N85-21237
SAKAI, J. N85-22291
N85-22292
N85-22293
SALAMA, S. Y. N85-21530
SALATINO, J. N85-21995
SALIK, J. N85-21264
N85-21324
SALOUR, M. M. N85-21636
N85-21996
N85-22145
SAMMELLS, A. F. N85-21314
SANDERS, J. L., JR. N85-21711
SANDERSON, A. C. N85-21998
N85-22146
N85-22147
SANDFORD, M. C. N85-21116
SANDFORD, M. T., II N85-22322
SANDUSKY, W. F. N85-21873
SANDWELL, D. T. N85-21787
SANFORD, T. B. N85-21918
SAPOV, M. M. N85-21535
SARAFANOV, T. N85-21533
SARAYEV, S. M. N85-21540
SATO, K. N85-22172
SAUER, H. H. N85-21868
SAUNDERS, M. A. N85-22028
SAUTHOFF, G. N85-21344
SAVAGE, R. N85-21733
SAVELSBURGH, M. W. P. N85-22075
SAVIK, Z. F. N85-21942
SAYERS, C. M. N85-22203
SCARF, F. L. N85-22312
SCARPACE, F. L. N85-22143
SCHANTZ, B. N85-21968
SCHARLEMANN, E. T. N85-21646
SCHEINBEIM, J. I. N85-21602
SCHEURER, B. N85-22072
SCHIPPERS, H. N85-21130
SCHLECHTWEG, R. E. N85-21653
SCHLENKER, G. J. N85-22089
SCHMIDT, S. K. N85-21314
SCHMIT, L. A. N85-21150
SCHMITT, R. N85-21897
SCHMOYER, R. N85-21966
SCHNEIDER, H. N85-21677
SCHOCK, H. W. N85-21795
SCHOLZ, R. N85-21411
SCHONFELD, F. W. N85-22128
N85-22129
N85-22131
SCHOPPEE, M. M. N85-21408
SCHOTT, J. R. N85-21726
SCHOWENGERDT, R. N85-21737
SCHRADER, M. E. N85-21332
SCHROEDER, B. N85-21792
SCHROTH, A. N85-21485
SCHUBERT, J. F. N85-21839
SCHUHMACHER, M. N85-21227
SCHULLER, F. T. N85-21658
SCHULTE, W. N85-22322
SCHULTZ, K. N85-21483
SCHULTZ, R. A. N85-21202
SCHULZ, S. N85-21797
SCHUMACHER, M. N85-21344
SCHUON, S. R. N85-21323
SCHUPP, G. N85-21627
SCHUSTER, G. J. N85-21630
SCHWARTZ, D. A. N85-22266
SCHWARTZ, S. E. N85-21819
SCHWEIGHARDT, F. K. N85-21302
SCHWENK, J. C. N85-21103
SCIAMA, D. W. N85-22289
SCOTT, C. D. N85-21262
N85-21573
SCOTT, M. N85-22232
SCRUBY, C. B. N85-21683
N85-21721
SEDLETSKIY, V. B. N85-21544
SEDOVA, Y. A. N85-21948
SEHMEL, G. A. N85-21843
SEIDEL, D. A. N85-21116
SEIDEL, H. N85-22202
SEIKO, Y. N85-21406
SEINFELD, J. H. N85-21844
SEKI, H. N85-21288
N85-21294

SELTZER, S. M. N85-21248
N85-21253
SEMANCIK, S. N85-21607
SENGERS, J. V. N85-21804
SERRANO, J. F. N85-22295
SETTER, D. M. N85-22022
SETZER, D. N85-21595
SEWARD, J. D., JR. N85-21181
N85-21182
SHAING, K. C. N85-22171
SHAN, X. N85-21425
SHANER, J. W. N85-22113
SHANNON, D. W. N85-21617
SHAPIRO, S. M. N85-22197
SHARP, D. N85-21589
SHARP, R. D. N85-21252
N85-21855
SHAUGHNESSY, G. N85-21275
SHEAFFER, J. D. N85-21847
SHELLEY, E. G. N85-21252
N85-21855
SHEPHARD, L. E. N85-21821
SHERIDAN, T. B. N85-22248
SHERMAN, M. P. N85-21299
SHETTY, D. K. N85-21379
SHI, Y. N85-22026
SHIELDS, M. W. N85-21498
SHILOV, V. M. N85-21953
SHIMADA, K. N85-21886
SHIRANE, G. N85-22198
SHOUB, E. C. N85-22330
SHPAGIN, A. V. N85-21565
SHRIVASTAVA, P. K. N85-21584
SHU, W. R. N85-21844
SHUGAR, T. A. N85-21702
SIAS, F. R., JR. N85-22233
SICA, L., JR. N85-22141
SICARD, A. J. N85-21138
SIEGMUND, D. N85-22100
SIFOROVA, T. A. N85-21611
SIKKA, V. K. N85-21409
SILIN, V. P. N85-22280
SILK, J. N85-22321
SILVESTRO, G. N85-22302
SIMIU, E. N85-21717
SIMON, M. N85-21788
SIMONOV, N. K. N85-21566
SINGER, I. L. N85-21330
SINHA, R. N85-21477
SIVJEE, G. G. N85-21860
SIVUK, A. K. N85-21948
SKARDA, J. R. N85-21873
SKELTON, J. N85-21408
SKROMME, B. J. N85-22181
SKVORTSOV, S. S. N85-21567
SKVORTSOV, Y. A. N85-21552
SLATER, P. N. N85-21733
N85-21756
SLIWINSKI, B. J. N85-21400
SLOBODNIK, A. J. N85-21500
SMART, A. E. N85-21604
SMARTT, H. B. N85-21670
SMERK, G. N85-22042
SMIALOWSKA, S. N85-21326
SMIRNOV, B. G. N85-21554
SMIRNOVA, I. A. N85-21542
SMITH, D. N85-21487
SMITH, D. G. N85-22234
SMITH, E. A. N85-21847
SMITH, F. A. N85-22173
SMITH, J. N85-21620
SMITH, J. E., JR. N85-22235
SMITH, K. A. N85-21594
SMITH, L. G. N85-21850
N85-21851
SMITH, L. L. N85-21985
SMITH, P. W. N85-21461
SMITH, R. H. N85-21177
SMITH, R. L. N85-21317
SMOLENSKI, J. N85-21995
SMORODINOV, V. V. N85-21566
SMYTH, D. M. N85-21369
SNIDE, J. A. N85-21275
SOBOLEVSKIY, V. I. N85-21945
SOIFER, B. T. N85-22267
SOLOMON, A. M. N85-21817
SONTAG, H. N85-21287
N85-21295
SORENSEN, D. C. N85-22034
SOVEY, J. S. N85-21256
N85-21259
N85-21260
SPAEH, R. N85-21797
SPALVINS, T. N85-21355
SPANG, S. T. N85-21522
SPANGLER, S. R. N85-22294
SPARLIN, D. M. N85-21307
SPERBER, R. N85-21208
SPICKER, J. N85-22300
SPIVAK, A. N. N85-21563
SPRANGLE, P. N85-21642
N85-21645
N85-22163
SPURRIER, J. D. N85-22066
SQUILLANTE, M. R. N85-21799
SRINIVASAN, G. R. N85-21113
ST.CLAIR, A. K. N85-21349
N85-21360
ST.CLAIR, T. L. N85-21349
N85-21360
STACEY, J. M. N85-21723
STACEY, K. A. N85-21721
STADNIK, I. P. N85-21559
STAHARA, S. S. N85-22331
STANLEY, J. H. N85-21678
STAROBINETS, S. N85-21453
STASSIS, C. N85-22194
STEARNS, J. W. N85-22167
STEC, L. J. N85-21472
STECURA, S. N85-21266
STELINGOVSKIY, K. V. N85-21952
STENSBY, J. L. N85-22236
STEPANOV, K. N. N85-22298
STEPANOV, V. N. N85-21558
STEPASHKIN, A. I. N85-21546
STEPHENS, M. A. N85-22062
STEPHENS, R. R. N85-21497
STEPHENS, W. D. N85-21390
N85-21391
N85-21393
N85-21394
N85-21395
STERN, R. N85-21625
STEWART, J. A. N85-21670
STIAVELLI, M. N85-22282
STILLMAN, G. E. N85-22181
STOCKDALE, R. E. N85-22165
STOFEL, E. J. N85-21661
STOLIKER, F. N. N85-21157
STOLYAROV, A. K. N85-21557
STONE, E. C. N85-22337
STORCH, J. N85-21693
N85-21694
STOTTS, L. B. N85-21281
STOWE, L. L. N85-21870
STRASZHEIM, M. N85-21328
STREED, E. R. N85-21801
STREHLOW, R. A. N85-21166
N85-21283
STROM, S. C. N85-21838
STRUBLE, L. J. N85-21809
N85-21816
STRUCHEV, V. F. N85-21548
STUDER, P. A. N85-21404
STUPIN, D. M. N85-21629
STURMAN, J. C. N85-21263
STYRON, J. B. N85-21456
N85-21459
SU, S. Y. N85-21188
N85-21193
SUDAN, R. N. N85-22163
SUDDETH, D. H. N85-21214
SUENAGA, M. N85-22191
SUGIHARA, R. N85-22292
SULLIVAN, D. J. N85-22116
SULLIVAN, R. G. N85-21617
SUOZZO, R. N85-21871
SUPPLEE, F. H., JR. N85-21610
SUTHERLAND, H. C., JR. N85-21963
SUTTLES, J. T. N85-21874
SWANSON, J. G. N85-21853
SWANSSON, N. S. N85-21663
SWENSON, C. A. N85-22113
SYMM, G. T. N85-22036

T

TADLOCK, W. E. N85-21336
TADMOR, E. N85-22049
TAJIMA, T. N85-22291
N85-22292
N85-22293
TAKAHARA, F. N85-22297
TAKAHASHI, S. N85-21891
TAKAHASHI, T. N85-21889
TALVACCHIO, J. N85-22185
TAM, A. C. N85-21287
N85-21295
TAMMELIN, B. N85-21883
TANAHASHI, S. N85-22172
TANG, C. M. N85-21642
N85-21645
N85-22163
TANGLER, J. L. N85-21805
TARAKJI, M. G. N85-21183
TASLIM, M. E. N85-21272
TAVADYAN, D. S. N85-21942
TAYLOR, G. E. N85-21817
TAYLOR, O. C. N85-21837
TAYLOR, P. N85-21262
TAYLOR, V. R. N85-21870
TCHENG, P. N85-21610
TEBBLE, R. S. N85-21371
TEI, S. N85-21255
TELSCHOW, K. L. N85-22114
TEREKHOV, V. P. N85-21564
TERPSTRA, A. P. N85-21254
TESI, G. N85-21819
THARP, M. L. N85-21817
THEOBALD, G. N85-21509
THIBADEAU, R. N85-21679
THIELE, G. A. N85-22151
THOMAS, D. T. N85-21475
THOMAS, J. E. N85-21481
THOMAS, R. W. N85-21752
THOMAS, W. C. N85-21801
THOMPSON, A. J. N85-21454
THOMPSON, G. L. N85-22091
THOMPSON, J. M. N85-22237
THORMODSGARD, J. M. N85-21746
THORP, J. M. N85-21826
THORSOS, E. I. N85-22112
THRESHER, R. N85-21714
THURSTANS, R. P. N85-22284
TIGRANYAN, R. A. N85-21935
N85-21954
TILTON, B. E. N85-21836
TINARI, D. F. N85-21609
TINGEY, D. T. N85-21837
TINGLEY, F. M. N85-21478
TISCHER, K. N85-21139
TITRAN, R. H. N85-21322
TOGASHI, M. N85-21888
TOI, K. N85-22172
TOKAREV, V. F. N85-21957
N85-21958
TOKUNO, M. N85-21891
TOLBERT, R. N. N85-22238
TOLLESTRUP, A. V. N85-22102
TOLLISON, D. K. N85-21248
N85-21249
N85-21253
TONEY, M. M. N85-21408
TORIKACHVILI, M. S. N85-22195
TORO, E. F. N85-21848
TRAVIS, B. J. N85-21576
TRAVLOS, A. J. N85-21752
TRICKETT, E. A. N85-21464
TRICOLES, G. N85-21445
TRIMBLE, J. L. N85-21817
TROMBKA, J. I. N85-21279
TROUT, A. M. N85-21168
TRUHAN, J. J. N85-21338
TSINGANOS, K. N85-22313
TSITSIKLIS, J. N. N85-22068
N85-22251
TSYTOVICH, V. N. N85-22286
TUCKER, E. E. N85-21306
TULYATHAN, P. N85-21468
TUOMI, T. J. N85-21852
TURCHI, P. J. N85-21496
TURNER, F. B. N85-21827
TUROLLA, R. N85-22307
TUTTLE, M. E. N85-21271
TUZOV, G. I. N85-21550
TYLER, W. S. N85-21838

U

UCHIYAMA, A. N85-21888
N85-21889
N85-21893
ULSAMER, W. N85-21780
ULSOY, A. G. N85-22041
ULYANOVA, I. A. N85-21948
URIELI, I. N85-21413
URSOV, V. N. N85-22280
USHAKOV, A. S. N85-21937
UTHE, E. E. N85-21845

V

VADAKAN, V. V. N85-21428
VAGER, Z. N85-22122
VAKULINA, O. P. N85-21954
VALID, R. N85-21684

VANDENBAN, E. P. N85-22094
N85-22095
VANDENDAM, R. F. N85-21254
VANDERWEES, A. J. N85-21593
VANETTEN, P. N85-21437
VANIMAN, D. T. N85-22138
VANLIEMPT, M. A. N85-21308
VANPOOLEN, L. J. N85-21804
VANTHULL, L. L. N85-21808
VANWOERKOM, P. T. L. M. N85-21254
VARMA, I. K. N85-21347
VARNASHENKO, A. P. N85-21939
VASILYEV, V. K. N85-21949
VASLOW, D. N85-21620
VAUGHAN, W. W. N85-21232
VEDULA, K. N85-21322
VELARDE, G. N85-22295
VENHUIZEN, J. R. N85-21127
VENTRICE, C. A. N85-22239
VENTRICE, M. B. N85-22240
VENTURINI, E. L. N85-21336
VEPSALAINEN, A. P. J. N85-22090
VERWEIJ, A. N85-21308
VESELOVSKIY, A. S. N85-21567
VETROVA, Y. G. N85-21951
VIEZEE, W. N85-21845
VIKHROV, N. I. N85-21939
VIKTOROV, A. N. N85-21952
VINCENT, A. N85-21429
VINEYARD, M. N85-21625
VIOLA, V. N85-22130
VISWANATHAN, R. N85-21477
VITYAZEV, V. V. N85-21546
VLASOVA, T. F. N85-21937
VOGELIUS, M. N85-21704
N85-22063
VOLKOVA, M. I. N85-21941
VONGLAHN, U. H. N85-21114
VONLAVANTE, E. N85-21119
VONPUTTKAMER, J. N85-22209
VONWARD, P. N85-21906
VORONIN, L. I. N85-21935
VOROTNIKOV, Y. V. N85-21944
VOSKRESENSKIY, A. D. N85-21939
VOSS, B. N85-21785
VOYTKO, J. J. N85-21507
VYKUKAL, H. C. N85-21986
N85-21987

W

WACKTER, D. N85-21835
WAGNER, C. N85-21792
WAGNER, R. N85-21411
WAITES, H. B. N85-21248
N85-21249
WAKSMAN, D. N85-21801
WALCHER, H. N85-21227
WALCK, J. C. N85-21460
WALDMANN, H. N85-21238
WALKER, H. A. N85-21831
WALKER, J. A. N85-21285
WALKER, R. N85-21432
WALL, S. L. N85-21752
WALLACE, J. F. N85-21320
WALLACE, J. S. N85-21372
WALLQUIST, D. L. N85-21601
WALSH, J. L. N85-21695
WALTERS, W. F. N85-22125
WANDELT, K. N85-21294
WANG, C. S. N85-22169
WANG, J. C. N85-22241
WANKLYN, J. N. N85-21316
WAPLES, P. J. N85-21237
WARBER, C. R. N85-21859
WARD, C. S. N85-21458
WARDE, C. N85-21996
N85-22145
WARE, W. H. N85-21474
WATERS, W. M. N85-21501
WATSON, A. I. N85-21910
WATSON, R. T. N85-21849
WAXMAN, M. N85-21804
WAYNANT, R. W. N85-21643
WEAR, J. D. N85-21168
WEATHERFORD, W. D., JR. N85-21289
WEAVER, J. H. N85-21293
WEBB, J. D. N85-21377
WEBB, J. W. N85-21817
WEBER, J. M. N85-21149
WEBER, R. N85-21366
WEGLEIN, R. D. N85-21681
WEGMANN, H. D. N85-21781
WEGSCHEIDER, J. N85-21145
WEI, M. N85-21421
WEIBO, C. N85-21420
WEILIAN, A. N85-21417
WEINSTEIN, L. M. N85-21178
WEISS, D. M. N85-22024
WEISS, J. N85-21173
WEISS, L. E. N85-21667
WEISSFELD, L. N85-21677
WELCH, J. D. N85-21136
WELLS, W. R. N85-21235
WELLVING, A. N85-21983
WEN, T. N85-21901
WERNER, C. L. N85-21483
WERON, A. N85-22098
WERON, K. N85-22098
WESSELS, B. W. N85-21314
WESSELS, H. N85-21716
WEST, D. C. N85-21817
WESTBERG, H. N85-21836
WESTCOTT, C. N85-21316
WESTHOFF, M. A. N85-21798
WESTON, A. R. N85-21176
WHALEN, M. V. N85-21259
N85-21260
WHANG, S. H. N85-21327
WHEELER, D. J. N85-21754
WHEELER, R. L., III N85-21574
WHIPPLE, R. D. N85-21147
WHITAKER, R. W. N85-22322
WHITBECK, J. F. N85-21811
WHITCHER, R. E. N85-21644
WHITE, D. J. N85-21447
N85-21452
N85-21455
WHITE, M. M. N85-21926
WHITLOCK, C. H. N85-21874
WHITTEN, J. L. N85-21334
WIBERLEY, S. E. N85-21268
WIEDER, H. H. N85-22176
WIEMHOEFER, H. D. N85-21794
WIKER, G. A. N85-21992
WILCOX, R. N85-21894
WILKENING, S. N85-21343
WILKINS, N. J. M. N85-21316
WILLIAMS, D. E. N85-21316
WILLIAMS, D. R. N85-21762
WILLIAMS, D. S. N85-22018
WILLIAMS, G. P. N85-22154
WILLIAMS, J. H., JR. N85-21673
WILLIAMS, J. M. N85-22030
WILLIAMS, K. E. N85-22031
N85-22032
WILLIAMS, R. S. N85-22183
N85-22184
N85-22187
WILLIS, J. C. N85-21998
WILSON, R. B. N85-21686
WINTERLING, G. N85-21788
WISE, G. L. N85-21476
WISE, H. N85-21301
WITUCKI, E. F. N85-21392
WOERPEL, J. C. N85-21853
WOLF, H. N85-21866
WOLFF, T. F. N85-21762
WOLFSBERG, K. N85-22138
WONG, P. N85-22197
WOO, W. N85-21854
WOODARD, J. P. N85-21993
WORLEY, H. E. N85-21253
WORLEY, S. D. N85-21291
WRIGHT, A. D. N85-21714
WRIGHT, D. T. N85-21431
WRIGHT, J. D. N85-21771
WRIGHT, M. H. N85-22028
WRIGLEY, R. C. N85-21743
WU, A. Y. N85-22064
WU, C. N85-21493
WYATT, E. N85-22042
WYETH, N. C. N85-22144

X

XIAOKUAN, G. N85-21417
XIONG, S. N85-21423

Y

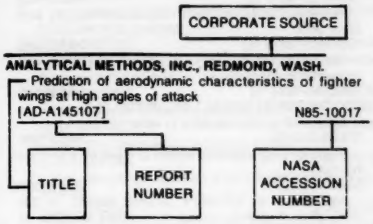
YAMAKAWA, K. A. N85-21652
YAMAURA, Y. N85-21233
YANCEY, C. W. C. N85-21717
YANCEY, K. E. N85-22242
YANG, K. N. N85-22195
YANIV, S. N85-21589
YAO, S. S. N85-21745
YAREMA, R. J. N85-21524
YAREMA, S. M. N85-21646
YASUDA, S. N85-21578
YEH, G. T. N85-22136
YELON, W. B. N85-21627
YEO, R. S. N85-21523
YIN, Y. Q. N85-22065
YODER, J. A. N85-21929
YOSHIZAWA, H. N85-22197
YOUNG, J. T. N85-21876
YU, T. L. N85-22170
YU, Y. H. N85-21112
YUNWEN, S. N85-21660

Z

ZABRANSKY, B. J. N85-22122
ZAEPFEL, K. P. N85-21877
ZALTSMAN, Y. N85-21556
ZAMBON, J. J. N85-21927
ZANA, L. M. N85-21258
ZANG, T. A. N85-21575
ZANINETTI, L. N85-22305
ZARDECKI, A. N85-21440
N85-21638
ZARE, R. N. N85-22115
ZARETSKY, E. V. N85-21658
ZELEZNIK, F. J. N85-22204
ZHANG, L. N85-21425
ZHANPENG, G. N85-21419
ZHU, P. N85-21424
ZHURAVLEV, V. V. N85-21950
ZIABICKI, A. N85-22174
ZIEGLER, K. R. N85-21320
ZIMMERMAN, A. H. N85-21505
ZIMMERMAN, G. O. N85-21274
N85-21276
ZIPPERIAN, T. E. N85-22200
ZOOK, H. A. N85-21202
N85-21205
N85-21221
ZULCH, D. I. N85-21433
ZWAAN, R. J. N85-21579
ZWARTBOL, T. N85-21254

CORPORATE SOURCE INDEX

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ABASTUMANI ASTROPHYSICAL OBSERVATORY, GEORGIA (USSR).
On the spectrum of longitudinal waves in the hot degenerate plasma N85-22280
Nonlinear waves in the magnetosphere of pulsars N85-22281
Thermal convection and magnetic fields in accretion disks of black holes N85-22285

ACADEMY OF SCIENCES (USSR), LENINGRAD.
Plasma and nuclear processes in solar matter N85-22277

ACADEMY OF SCIENCES (USSR), MOSCOW.
Cosmic ray generation by plasma turbulence: Development of a new paradigm in physics N85-22266

ADMIRALTY RESEARCH ESTABLISHMENT, PORTLAND (ENGLAND).
The imaging of internal waves by the SEASAT-A synthetic aperture radar
[AD-A149808] N85-21761

ADVANCED RESEARCH AND APPLICATIONS CORP., SUNNYVALE, CALIF.
A new NDE (Non-Destructive Evaluation) capability for thin-shelled structures
[AD-A149625] N85-21678

ADVANCED RESEARCH RESOURCES ORGANIZATION, BETHESDA, MD.
Team dimensions: Their identity, their measurement and their relationships
[AD-A149662] N85-21978

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
The clinical and biomedical evaluation of trauma and fatalities associated with aircrew ejection and crash. A Working Group report
[AGARD-AR-194] N85-21969

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS (FRANCE).
Technical evaluation report on the FDP Symposium on Flight Test Techniques
[AGARD-AR-206] N85-21157

AEG-TELEFUNKEN, FRANKFURT AM MAIN (WEST GERMANY).
Amorphous silicon solar cells with a view to cheap production processes N85-21789

AEG-TELEFUNKEN, HEILBRONN (WEST GERMANY).
Development and prototype construction of photovoltaic energy supply units N85-21781

AEROCHEM RESEARCH LABS., INC., PRINCETON, N. J.
Ionic mechanisms of soot formation in flames
[AD-A150119] N85-21297

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Description of a technique to measure spray distribution in an air stream
[AD-A149780] N85-21122
On the application of compatibility checking techniques to dynamic flight test data
[ARL-AERO-R-161] N85-21151
Fatigue crack propagation in mirage 1110 wing main spar specimens and the effects of spectrum truncation on life
[ARL-STRUC-R-405] N85-21152
Deflection model of a CT4-A undercarriage
[AD-A149778] N85-21156
Hydrogen embrittlement of cadmium-plated ultra-high strength steels in paint strippers
[ARL-MAT-R-117] N85-21326
Applications of vibration analysis to the condition monitoring of rolling element bearings
[ARL-AERO-PROP-R-163] N85-21663
Finite element analysis of problems associated with life enhancement techniques
[ARL-STRUC-R-404] N85-21676
On the stress analysis of bonded inserts
[ARL-STRUC-R-407] N85-21696
The residual strength of cracked specimens representing a section of the mirage into wing main spar
[ARL-STRUC-R-408] N85-21699
Stresses in a half-plane containing either a pressurized hole or an interference-fit disc
[ARL-STRUC-R-409] N85-21700
Elastic response of a half-plane to a bonded interference-fit disc of the same material
[ARL-STRUC-R-406] N85-21701
Plasma mass and effective inductance in a small railbow
[MRL-R-947] N85-22162

AEROSPACE CORP., EL SEGUNDO, CALIF.
Assessment of satellite collision hazards by simulated sampling in space N85-21195
Description of the SSB/A (Special Sensor B/Aerospace X-ray spectrometer
[AD-A150040] N85-21236
Nickel-cadmium battery cell reversal from resistive network effects
[AD-A149626] N85-21505

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Choice reaction time and color: An annotated bibliography
[AD-A149722] N85-21979

AIR FORCE ACADEMY, COLO.
Air Force Academy Aeronautics Digest
[AD-A149614] N85-21104
The seven-hole pressure probe
[AD-A149799] N85-21615

AIR FORCE OCCUPATIONAL AND ENVIRONMENTAL HEALTH LAB., BROOKS AFB, TEX.
Radio Frequency Radiation (RFR) measurements in operational settings
[AD-A149717] N85-21471
The medical results of human exposures to radio frequency radiation
[AD-A149718] N85-21962

AIR FORCE PACKAGING EVALUATION AGENCY, WRIGHT-PATTERSON AFB, OHIO.
Evaluation of air and ground launched cruise missile navigational element containers
[AD-A149654] N85-21136

AIR FORCE SATELLITE CONTROL FACILITY, SUNNYVALE, CALIF.
Geosynchronous satellite collision avoidance N85-21197

AIR FORCE SPACE DIV., LOS ANGELES, CALIF.
Air Force satellite position management N85-21217

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Synthesis and thermomechanical properties of new AT-Phenylene R systems
[AD-A149961] N85-21372

AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.
Study of the kinetics of hydrogenation using aged catalysts
[DE85-004373] N85-21302

AKRON UNIV., OHIO.
An investigation of compressible flows over open cavities including shear layer thickness effects
[AD-A150088] N85-21588
Viscoplastic constitutive relationships with dependence on thermomechanical history
[NASA-CR-174836] N85-21691

ALABAMA A & M UNIV., NORMAL.
SRM filament wound case resin characterization studies N85-22212
A computer controlled mass spectrometer system for investigating the decomposition of non-metallic materials under atmospheric conditions N85-22237
Theoretical interpretation of thermal arrest data from differential thermal analysis measurements N85-22241

ALABAMA UNIV., BIRMINGHAM.
Evaluation of expert systems N85-22229

ALABAMA UNIV., HUNTSVILLE.
Experimental determination of systems suitable for study as monotectic binary metallic alloy solidification models N85-22235
New results on the PLL false lock phenomenon N85-22236

ALABAMA UNIV., TUSCALOOSA.
Research Reports: 1984 NASA/ASEE Summer Faculty Fellowship Program
[NASA-CR-171317] N85-22210
A mathematical formulation of the problem of optimal use of ground resources for future space missions N85-22232

ALASKA UNIV., FAIRBANKS.
High time resolution thermospheric temperature and wind studies in the Arctic
[AD-A150114] N85-21660

ALBANY INTERNATIONAL CORP., DEDHAM, MASS.
Finger materials for air cushion vehicles. Volume 2: Base fabrics for finger materials
[AD-A149701] N85-21408

ALPHATECH, INC., BURLINGTON, MASS.
Automatic control design procedures for restructurable aircraft control
[NASA-CR-172489] N85-21173

AMERICAN EMBASSY, PARIS (FRANCE).
Glossary of the soil sciences
[PB85-133452] N85-22263

AMERICAN SOCIETY FOR ENGINEERING EDUCATION, WASHINGTON, D. C.
Design of graphic displays in computerized systems
[AD-A150071] N85-22027

AMES LAB., IOWA.
Neutron scattering studies of graphite intercalation compounds
[DE85-003079] N85-22196

APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
A study of low-level laser retinal damage
[AD-A150048] N85-21965

ARGONNE NATIONAL LAB., ILL.
Sputter-induced compositional modifications in a Ni-Au alloy
[DE85-002771] N85-21333
Characterization and optimization of polyethylene resins and gas pipe
[PB85-116511] N85-21382
In-beam tests of an air-core superconducting-solenoid particle spectrometer
[DE85-004029] N85-21625
Electromagnetic Acoustic Transducers (EMATs) for erosion monitoring
[DE85-004834] N85-21626
The automated reasoning system ITP
[ANL-84-27] N85-22016
Software for special functions
[DE85-004684] N85-22033
Parallel linear algebra library for the Denelcor HEP
[DE85-004685] N85-22034

Multiparticle 3D imaging technique to study the structure of molecular ions
[DE85-001843] N85-22122
Tritium catalyzed deuterium Tokamaks
[DE85-004825] N85-22166
Experimental investigations of thermal radiation from potassium atoms in magnetohydrodynamic system: Preliminary report
[DE85-003715] N85-22169
Green's function solution of the Kondo problems and universality of the thermodynamic properties
[DE85-002739] N85-22206

ARIZONA UNIV., TUCSON.
Numerical study of large-eddy breakup and its effect on the drag characteristics of boundary layers
[NASA-CR-3984] N85-21272
In-progress absolute radiometric inflight calibration of the LANDSAT-4 sensors N85-21733
MTF analysis of EANDSAT-4 Thematic Mapper N85-21737
Spectroradiometric calibration of the Thematic Mapper and Multispectral Scanner system
[E85-10094] N85-21756
The ultraviolet excess of quasars 3: The highly polarized quasars PKS 0736+017 and PKS 1510-089
[NASA-CR-175576] N85-22268

ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Suspension torques on a gimballed electrostatically supported gyroscope and requirements on the gyroscope and spacecraft for the relativity gyroscope experiment N85-21608

ARMY ARMAMENT MUNITIONS AND CHEMICAL COMMAND, ROCK ISLAND, ILL.
Statistics for the maximum of several positive random variables with application to networking
[AD-A150005] N85-22069

ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND, WATERVLIET, N. Y.
Teladit: An enhanced editor for Direct View Storage Tube (DVST) graphics display devices
[AD-A149715] N85-22021

ARMY CONSTRUCTION ENGINEERING RESEARCH LAB., CHAMPAIGN, ILL.
Corrosion and coatings review of specifications and drawings of facilities for the Oman Military Construction Program at Masirah Island, Oman
[AD-A149739] N85-21366
Diesel fuel alternatives for engines in civil works prime movers
[AD-A149738] N85-21400
Development and evaluation of a procedure for the rapid analysis of fresh concrete
[AD-A149741] N85-21703

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Computer-Aided Structural Engineering (CASE) project. Seepage analysis of confined flow problems by the method of fragments (CFRAG)
[AD-A150015] N85-21782
An analysis of short-to-medium-range seismic attenuation tests using a multilayered viscoelastic seismic propagation model
[AD-A149771] N85-21856

ARMY FUELS AND LUBRICANTS RESEARCH LAB., SAN ANTONIO, TEX.
A brief review of the technology of microemulsions and other micellar systems
[AD-A149759] N85-21269

ARMY MATERIALS AND MECHANICS RESEARCH CENTER, WATERTOWN, MASS.
Fiber reinforced fused silica for hypersonic radome applications
[AD-P004366] N85-21460
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[AD-A150042] N85-21710

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The ambiguity function and the Wigner distribution
[AD-A150095] N85-21482

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[AD-P004371] N85-21465

ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD.
Landing control centrals
[AD-A149800] N85-21140
Direction finder set, radio
[AD-A149958] N85-21142

AUBURN UNIV., ALA.
An infrared study of the dissociation of carbon dioxide over supported rhodium catalysts
[AD-A149613] N85-21291
Singular asymptotic expansions in nonlinear rotordynamics N85-22218
Characterization of material surfaces exposed to atomic oxygen on space shuttle missions N85-22220
The strength and characteristics of VPPA welded 2219-T87 aluminum alloy N85-22224

AVIONS MARCEL DASSAULT-BREGUET AVIATION, SAINT-CLOUD (FRANCE).
Comparison of the fatigue resistance (initiation, propagation) of cast TA6V with hot rolled TA6V
[DGT-25369-PT-1] N85-21341

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
An orthogonal grid technique for studying internal deformation and energy absorption in target penetration
[AD-A149989] N85-21665
Systems vulnerability and lethality in the development phase
[AD-A149737] N85-22069

BATTELLE COLUMBUS LABS., OHIO.
A model for the evolution of on-orbit manmade debris environment N85-21196
Orbital debris policy issues: Battelle involvement and some personal observations N85-21216
Multiaxial stress response of ceramics
[DE85-004350] N85-21379
Evaluation of the vocabulary switching systems
[PB85-127157] N85-22260

BATTELLE INST., FRANKFURT AM MAIN (WEST GERMANY).
Development of a CdSe thin film solar cell N85-21796

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
ELECT groundwater transport research code
[DE85-003284] N85-21824
Methods/materials matrix of ultimate disposal techniques for spilled hazardous materials
[PB85-116853] N85-21833
Hazardous air pollutants: Wet removal rates and mechanisms
[PB85-138626] N85-21842
Hazardous air pollutants: Dry-deposition phenomena
[PB85-138279] N85-21843

BAYER A.G., DORMAGEN (WEST GERMANY).
Hydrolysis of plastic wastes with the aim of recovering and reprocessing the starting components (recycling)
[BMFT-FB-T-84-250] N85-21828

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Polymer intermediates from limonene (follow-up project)
[BMFT-FB-T-84-243] N85-21380

BERRY COLL., MOUNT BERRY, GA.
Evaluation of OMV ranging and docking systems N85-22230

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Development of the sonic pump levitator
[NASA-CR-171382] N85-21186

BMC ACRYLCHEMIE G.M.B.H., WERMELSKIRCHEN (WEST GERMANY).
Photovoltaic roofing tile systems N85-21783

BOEING AEROSPACE CO., SEATTLE, WASH.
Space debris protection for a reusable orbital transfer vehicle N85-21208

BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Maintainability time standards for electronic equipment
[AD-A149684] N85-21507

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[AD-A150097] N85-21900

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Viscous jets N85-22308
A Jamin interferometer to determine the helium abundance in the atmosphere of Jupiter
[BONN-IR-83-17] N85-22329

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Investigation of electric and magnetic properties of intercalated graphite
[AD-A149801] N85-21274
Electric and magnetic properties of intercalated graphite
[AD-A149848] N85-21276

BOTSWANA TECHNOLOGY CENTRE, GABORONE.
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[PB85-124097] N85-21814

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[BBC-RD-1985/2] N85-21430
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[BBC-RD-1984/16] N85-21442
The 20:16 block code for digital recording and transmission channels
[BBC-RD-1985/1] N85-21443

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Alternative anodic reactions in water splitting
[DE85-004159] N85-21300
Magnetic X-ray scattering studies of the rare Earth metal holmium
[DE85-003608] N85-21335
Applicability of laboratory kinetics studies to the evaluation of aqueous phase atmospheric oxidation of sulfur-4
[DE85-000586] N85-21819
Gas-liquid chemistry of natural waters, volume 1
[DE85-002603] N85-21822
Gas-liquid chemistry of natural waters, volume 2
[DE85-002457] N85-21823
Beam loss due to the aperture limitation resulting from intrabeam scattering
[DE85-005136] N85-22124
Intense, broadband, pulsed I-R source at the National Synchrotron Light Source
[DE84-010542] N85-22154
Properties of Ti alloyed multifilamentary Nb3Sn wires by internal tin process
[DE85-003212] N85-22191
High energy facilities advanced projects: Intrabeam scattering for a beam of gold ions
[DE85-000887] N85-22192
Measurement of the induced moment magnetic form factor of a heavy fermion superconductor
[DE85-004165] N85-22194
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197
Paramagnetic scattering from Ni
[DE85-004207] N85-22198

BROWN UNIV., PROVIDENCE, R. I.
Two-phase flow in geothermal systems
[DE85-004882] N85-21591

BRUNSWICK CORP., MARION, VA.
Supersonic Tactical Missile (STM) radome development
[AD-P004360] N85-21454
Automated radome testing
[AD-P004362] N85-21456
A broadband kevlar radome for shipboard
[AD-P004365] N85-21459
LL-100: A new polybutadiene (resin system for radome applications)
[AD-P004368] N85-21462
Nose and inlet duct radomes for the firebolt aerial target
[AD-P004375] N85-21469

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C

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Wide-field-of-view, helmet-mounted infinity display system development
[AD-A149641] N85-21159

CALHOUN COMMUNITY COLL., DECATUR, ALA.
Investigation of foam flotation and phase partitioning techniques N85-22216

CALIFORNIA INST. OF TECH., PASADENA.
Research in particles and fields
[NASA-CR-175472] N85-22337

CALIFORNIA UNIV., BERKELEY.
Turbulent convecting flow in a square duct with a 180 deg bend: An experimental and numerical study
[AD-A149969] N85-21583

Remote sensing research for agricultural applications
[E85-10090] N85-21752
Nonlinear sigma-models and integration methods
[DE85-004447] N85-22071
Galaxy formation N85-22321

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Electrochemical processes at the sodium (BETA)" alumina interface
[DE85-004653] N85-21305
Algorithm for the simulation of transient viscoelastic flows with free surfaces
[DE85-002713] N85-21590
Microprocessor-controlled anodic stripping voltammeter for trace metal analysis in tap water
[DE85-002781] N85-21619
Ultrasensitive measuring devices
[DE85-000672] N85-21622
Statistical phenomena in particle beams
[DE85-001050] N85-22118
Negative lithium emission from a tungsten surface in a plasma
[DE85-003456] N85-22167
Electron image simulation: A complementary processing technique
[DE85-000685] N85-22190
Requirements for a database management system
[DE85-004661] N85-22259

CALIFORNIA UNIV., DAVIS.
Numerical simulation of static and dynamic shadow patterns using an atomistic description of crack initiation and propagation
[DE85-003226] N85-21715
Analysis and computations of microwave-atmospheric interactions
[AD-A149666] N85-21854

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Electrochemical cell to measure corrosion rates in noncondensing environments
[DE85-003148] N85-21338
Neutral beam injector oxygen impurity measurements and concentration reduction via gettering processes
[DE85-000861] N85-21521
Use of the ORACLE DEMS in determining the response of complex scientific instrumentation
[DE85-001742] N85-21621
Enhancing the performance of a high-gain free electron laser operating at millimeter wavelengths
[DE85-000862] N85-21646
Advanced crystalline laser materials
[DE85-003142] N85-21647
Nondestructive method for detecting machine damage in beryllium
[DE85-001074] N85-21681
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain
[DE85-003294] N85-21864
Oceanic role in terrestrial climate
[DE85-004422] N85-21904
MFTF sensor verification computer program
[DE85-004452] N85-22029
Processes and problems in secondary star formation
[DE85-003623] N85-22322

CALIFORNIA UNIV., LOS ANGELES.
Alternative approximation concepts for space frame synthesis
[NASA-CR-172526] N85-21150
The synthesis, structural characterization and reactions of closo-Rhodacarborane Anions containing a formal d8 metal vertex 1,2
[AD-A149640] N85-21285
Gain enhancement methods for printed circuit antennas
[AD-A150090] N85-21517
Ecological observations at the site of the 10 MWe solar thermal power system (1978-1984)
[DE85-004572] N85-21827
USC (University of Southern California) Sea Grant Program Directory, 1984-1985
[PB85-135051] N85-21922
The future of lightwave technology
[PB85-109759] N85-22155
Angle-resolved photoemission study of AuGa2 and AuIn2 intermetallic compounds
[AD-A150000] N85-22183
The Valence- and conduction-band structure of the sapphire (1102) surface
[AD-A150001] N85-22184
A mixed-basis band structure interpolation scheme applied to the fluorite structure compounds NiSi2, AuAl2, AuGa2 and AuIn2
[AD-A150131] N85-22187

CALIFORNIA UNIV., SAN DIEGO.
A two-dimensional smoothing spline and a regression problem
[AD-A149824] N85-22067

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
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[AD-A150023] N85-22149

CALIFORNIA UNIV., SANTA BARBARA.
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[AD-A150117] N85-21375

CALSPAN ADVANCED TECHNOLOGY CENTER, BUFFALO, N.Y.
Numerical studies of fluid spin-up from rest in a partially-filled cylinder
[AD-A150079] N85-21586
Experimental studies of Quasi-Two-Dimensional and three-dimensional viscous interaction regions induced by skewed-shock and swept-shock boundary layer interactions
[AD-A150080] N85-21587
Investigation of the initial events in biofouling
[AD-A149995] N85-21927

CANADA CENTRE FOR REMOTE SENSING, OTTAWA (ONTARIO).
Preliminary evaluation of the radiometric calibration of LANDSAT-4 Thematic Mapper data by the Canada Centre for Remote Sensing N85-21729

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Dynamic world modeling for an intelligent mobile robot using a rotating ultra-sonic ranging device
[AD-A149979] N85-21143
Navigation for an intelligent mobile robot
[AD-A150051] N85-21144
A functional vehicle for autonomous mobile robot research
[AD-A150052] N85-21666
Dynamic visual servo control of robots: An adaptive image-based approach
[AD-A150057] N85-21667
Impacts of robotic and flexible manufacturing technologies on manufacturing costs and employment
[AD-A150060] N85-21668
Mechanical properties for the grasp of a robotic hand
[AD-A150062] N85-21669
The state of the art in printed wiring board inspection
[AD-A149871] N85-21679
Human assembly time versus levels of visual and tactile sensory input: Experimental results for five devices
[AD-A149982] N85-21980
The man-machine interface
[AD-A149971] N85-21989
RAPIDbus: Design of an extensible multiprocessor structure
[AD-A150061] N85-21996
Learning to search. From weak methods to domain-specific heuristics
[AD-A149949] N85-22045
Maximum matchings in a class of random graphs
[AD-A149663] N85-22060
State dependent priority rules for scheduling
[AD-A149972] N85-22090
Needs, opportunities, and options for large scale systems research
[DE85-004642] N85-22091
Determining object orientation from a single image using multiple information sources
[AD-A149980] N85-22146
Multiple resolution representation and probabilistic matching of 2-D gray-scale shape
[AD-A149981] N85-22147
Design of an optical proximity sensor using multiple cones of light for measuring surface shape
[AD-A150050] N85-22152

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
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[NASA-CR-174841] N85-21320
Translational and extensional energy release rates (the J- and M-integrals) for a crack layer in thermoelasticity
[NASA-CR-174872] N85-21685

CASTLE TECHNOLOGY CORP., WOBURN, MASS.
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[DE85-001031] N85-21519

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A proposal for standard basic functions in Ada
[CWI-NM-R8407] N85-22036
Harmonic analysis and Radon transforms on pencils of geodesics
[CWI-PM-R8413] N85-22074
Local search in routing problems with time windows
[CWI-OS-R8409] N85-22075

CLERMONT-FERRAND UNIV. (FRANCE).
Convergence rates in the strong law for bounded mixing sequences
[CWI-MS-R8412] N85-22076
On ergodic actions whose self-joinings are graphs
[CWI-PM-R8408] N85-22093
Invariant differential operators on a semisimple symmetric space and finite multiplicities in a Plancherel formula
[CWI-PM-R8409] N85-22094
Asymptotic behavior of matrix coefficients related to reductive symmetric spaces
[CWI-PM-R8410] N85-22095
Experimental mathematics
[CWI-PM-R8411] N85-22096
Brownian motion with a parabolic drift and Airy functions
[CWI-MS-R8413] N85-22097

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Cosmic ray composition and origin N85-22287

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[AD-A149699] N85-21509

CHARLES RIVER ASSOCIATES, INC., BOSTON, MASS.
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[PB85-113082] N85-21383
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New high resolution scanning ion microprobe and focused ion beam applications
[AD-A149992] N85-21616

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A GC/MS (Gas Chromatograph/Mass Spectrometer) data management process. Part 1: User's guide, version 1.0
[PB85-116051] N85-21309
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[PB85-116069] N85-21310

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Oceanographic and meteorological research based on the data products of SEASAT
[E85-10091] N85-21753

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[FAA/PM-84-12-VOL-1] N85-21180
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[FAA/PM-84-12-VOL-2] N85-21181
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[FAA/PM-84-12-VOL-3] N85-21182
Field validation of statistically-based acceptance plan for bituminous airport pavements. Volume 4: Computer simulation of multiple acceptance criteria
[FAA/PM-84-12-VOL-4] N85-21183
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Sensor control of robot arc welding N85-22233

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[AD-A149595] N85-21917
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Hurricane alicia storm surge and wave data
[AD-A149668] N85-21896
COLORADO SCHOOL OF MINES, GOLDEN.
Velocity inversion using a stratified reference
[AD-A150062] N85-21858
Research on ocean floor electrical surveys
[AD-A149831] N85-21920
COLORADO STATE UNIV., FORT COLLINS.
Wind-tunnel research on the mechanics of plumes in the atmospheric surface layer
[AD-A150019] N85-21584
Performance evaluation of an active solar cooling system utilizing low cost plastic collectors and an evaporatively-cooled absorption chiller
[DE84-010813] N85-21798
Measurements of the surface energy budget in the southern Gobi Desert of China, and in the Rocky Mountains of Colorado
[NASA-CR-175506] N85-21847
Varying structure and intensity change characteristics of 4 Western North Pacific tropical cyclones
[AD-A149628] N85-21895
COLORADO UNIV., BOULDER.
Theoretical nuclear physics
[DE85-003466] N85-22135
COLUMBIA UNIV., NEW YORK.
The eigenstructure assignment of deadbeat control systems
[AD-A149761] N85-21510
Practical considerations for noninteracting control synthesis
[AD-A150130] N85-22046
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[AD-A149650] N85-22059
COMMERCE DEPT., WASHINGTON, D.C.
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[PB85-132884] N85-21529
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[S-REPT-98-656] N85-21225
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[S-EXEC-REPT-98-52] N85-21234
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Transfer of technology
[S-REPT-98-664] N85-22246
Transfer of technology
[S-HRG-98-966] N85-22247
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[GPO-37-459] N85-21818
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[GPO-38-222] N85-21132
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[GPO-38-948] N85-21131
Results of Space Shuttle flight 41-D
[GPO-39-481] N85-21243
Developments in the production and use of ethanol fuels
[GPO-40-678] N85-21398
Wind shear detection technology
[GPO-38-920] N85-21879
Hurricane storm surge research
[GPO-40-048] N85-21880
Computer and communications security and privacy
[GPO-39-741] N85-21994
Oversight review of the five-year outlook report on science and technology
[GPO-41-058] N85-22243
1984 science and technology posture hearing with the director of the Office of Science and Technology Policy
[GPO-41-060] N85-22244
An agenda for a study of government science policy
[GPO-40-860] N85-22245
The availability of Japanese scientific and technical information in the United States
[GPO-39-478] N85-22254
Summary of activities of the Committee on Science and Technology
[H-REPT-98-1189] N85-22341
COMMUNICATIONS RESEARCH CENTRE, OTTAWA (ONTARIO).
Stability analysis of flexible spacecraft with PID controller
[CRC-1372] N85-21247
Estimation of the impulse response of television channels from digitized waveforms
[CRC-1376] N85-21429
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[NASA-CASE-GSC-12808-1] N85-21279
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[AD-A149797] N85-21139
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[NASA-CR-175157] N85-21894
CONTROL DYNAMICS CO., HUNTSVILLE, ALA.
ACOSS 17 (Active Control of Space Structures)
[AD-A150007] N85-21253
CORNELL UNIV., ITHACA, N.Y.
A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3878] N85-21117
Heterocontact effects in point contact electron-phonon spectroscopy of the alkali metals
[AD-A149760] N85-21290
Summary of recent research on mechanical behavior of polycrystalline solids
[DE85-004601] N85-22199
CRANFIELD INST. OF TECH., BEDFORD (ENGLAND).
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[COLL-AERON-8413] N85-21175
On the coupling of an anchored flame with an acoustic field
[COLL-AERON-8434] N85-21282
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[COLL-AERON-8501] N85-21848

D

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Sector analysis of relevant meteorological parameters for long range transport of air pollutants
[NR-27] N85-21882
DAVID SARNOFF RESEARCH CENTER, PRINCETON, N.J.
1.5 to 1.7 micrometers LEDs (Light-Emitting Diode)
[AD-A149685] N85-21508
DAYTON UNIV., OHIO.
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[AD-A149810] N85-21275
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[AD-A150038] N85-22151
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[AD-D011507] N85-21148
Flameholder with integrated air mixer
[AD-D011549] N85-21161
Translating rudder pedal system
[AD-D011510] N85-21172
Integrated insulation wall assembly
[AD-D011553] N85-21257
Method for refining microstructures of cast titanium articles
[AD-D011518] N85-21318
Plasticizer system for propellant compositions
[AD-D011502] N85-21390
Plasticizer system for propellant compositions
[AD-D011508] N85-21391
Azido nitramino ether containing solid propellants
[AD-D011511] N85-21392
Plasticizer system for propellant compositions
[AD-D011514] N85-21393
Plasticizer system for propellant compositions
[AD-D011516] N85-21394
Plasticizer system for propellant compositions
[AD-D011517] N85-21395
Method of multivariant intraclass pattern recognition
[AD-D011546] N85-21405
Radar calibration using direct measurement equipment and oblique photometry
[AD-D011530] N85-21433
Multiple loop sidelobe canceller
[AD-D011533] N85-21434
Low sidelobe phased array antenna system
[AD-D011558] N85-21435
Method and means for providing frequency agile operation of MTI (Moving Target Indicator) radar
[AD-D011561] N85-21436
Detection of angular modulated electromagnetic signals
[AD-D011563] N85-21437
Method for the fabrication of dielectric isolated junction field effect transistor and PNP transistor
[AD-D011500] N85-21494
Deployable folded antenna apparatus
[AD-D011503] N85-21495
Power circuit utilizing self-excited Hall effect switch means
[AD-D011505] N85-21496
Imaging apparatus for transverse electrode electro-optic tunable filter
[AD-D011524] N85-21497
Printed circuit balun with a dipole antenna
[AD-D011534] N85-21498
SAW oscillator with digital compensation for the temperature related frequency changes
[AD-D011537] N85-21500
Wide angle phased array dome lens antenna with a reflection/transmission switch
[AD-D011562] N85-21502
Retinal information mapping system
[AD-D011531] N85-21601
Eddy current test probe with circumferential segments and method of testing material surrounding fastener holes
[AD-D011554] N85-21603
Pulse transformer package for impedance matching a laser diode to a transmission line
[AD-D011499] N85-21632
Axial flow laser cavity
[AD-D011506] N85-21633
Laser clock
[AD-D011513] N85-21634
Multiple double heterojunction buried laser device
[AD-D011519] N85-21635
Transmissive Dewar cooling chamber for optically pumped semiconductor ring lasers
[AD-D011550] N85-21636
Optically pumped iodine monofluoride laser
[AD-D011555] N85-21637
High pressure turbine rotor two-piece blade retainer
[AD-D011498] N85-21653
Cooled turbine blade tip closure
[AD-D011525] N85-21654
Releasable cable connector assembly for use between a mobile and stationary object
[AD-D011538] N85-21655
Pneumatic clamping device
[AD-D011544] N85-21656
A review of fatality, impairment of consciousness, and head/neck injury on USAF ejections 1971 - July 1983 N85-21974
Windblast arm protector assembly
[AD-D011512] N85-21984
Variable data base generator apparatus
[AD-D011515] N85-21993
Method and apparatus for detecting acoustic emissions from metal matrix wire
[AD-D011556] N85-22107
RF-Primed high power halogen vial apparatus
[AD-D011545] N85-22156
Method for the preparation of epitaxial films of mercury cadmium telluride
[AD-D011532] N85-22175
Process for the epitaxial deposition of III-V compounds utilizing a continuous in-situ hydrogen chloride etch
[AD-D011557] N85-22177
DEPARTMENT OF THE ARMY, WASHINGTON, D. C.
Amine salts as bonding agents
[AD-D011543] N85-21396

Normal coordinate monolithic crystal filter
[AD-D011496] N85-22188
Stress compensation crystal device
[AD-D011497] N85-22189

DEPARTMENT OF THE NAVY, WASHINGTON, D. C.
A method for determining in situ the absorption coefficient of particulate media using pulsed laser technique
[AD-D011548] N85-21281
Low temperature deposition of nickel films
[AD-D011566] N85-21319
Fluorinated polyurethanes
[AD-D011526] N85-21353
Rubber modified epoxy adhesive
[AD-D011527] N85-21354
Combined microwave parallel amplifier-RF attenuator/modulator
[AD-D011535] N85-21499
Digital coherent detector
[AD-D011560] N85-21501
Remote self-contained undersea monitor
[AD-D011520] N85-21599
Rotating squid magnetometers and gradiometers
[AD-D011529] N85-21600
Piezoelectric transducer using electrically poled gamma-phase Nylon 11
[AD-D011552] N85-21602
A review of neck injury and impaired consciousness associated with US Navy ejections 1 January 1969 - 31 December 1979 N85-21973
Calibration method for acoustic scattering measurements using a spherical target
[AD-D011521] N85-22106
Atmospheric transmissometer
[AD-D011540] N85-22140
High resolution diffraction grating
[AD-D011541] N85-22141
Temperature-insensitive optical fibers
[AD-D011551] N85-22142
Process for making a heterojunction source-drain insulated gate field-effect transistors utilizing diffusion to form the lattice
[AD-D011536] N85-22176

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
Algorithms for automatic four-dimensional aircraft guidance, considering the momentary wind situation
[DFVLR-FB-84-40] N85-21146

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Prospective investigations with DFVLR radar of possible relevance in the assessment of radio interference due to scattering from precipitations
[DFVLR-FB-84-42] N85-21485
Programs for dynamic loading of precompiled subroutine packages, especially for applications with the Watfiv compiler
[DFVLR-MITT-84-18] N85-22035

DORTMUND UNIV. (WEST GERMANY).
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DRAPER (CHARLES STARK) LAB., INC., CAMBRIDGE, MASS.
Planar dynamics of a uniform beam with rigid bodies affixed to the ends
[NASA-CR-175566] N85-21693
Transverse vibration and buckling of a cantilevered beam with tip body under constant axial base acceleration
[NASA-CR-175567] N85-21694

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S.C.
Modeling interception of rainfall by forests and the role of interception in the water balance
[DE85-002822] N85-21825

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[AD-A150121] N85-21928

E

ECOLE POLYTECHNIQUE, PALAISEAU (FRANCE).
About static and dynamic solutions of the aligned rotator model N85-22306
Small scale structure and the Spinar model for active galactic nuclei N85-22316

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Techniques to analyze vehicle coastdown data
[DE85-005159] N85-21127
Heat Cycle Research Experimental Program report, FY-84
[DE85-003558] N85-21811
Effects of scatterer spacing statistics on ultrasonic backscatter signal spectra
[DE85-003250] N85-22114

EG AND G WASHINGTON ANALYTICAL SERVICES CENTER, INC., MORGANTOWN, W. VA.
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[DE85-001974] N85-22031
VAX-ASPEN installation guide
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EIC, INC., NORWOOD, MASS.
Research to explore the feasibility of sulfolanes as electrolytic solvents for rechargeable lithium batteries
[DE85-004345] N85-21525

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A radome for air traffic control SSR radar systems
[AD-P004373] N85-21467

ELECTRONIC SYSTEM G.M.B.H., MUNICH (WEST GERMANY).
Program INNAVSAT: Global Positioning System (GPS): Test and demonstration program
[BMFT-FB-W-84-047] N85-21145

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Development of silicon nitride materials for the casting of solar cell silicon N85-21779

ELTRON RESEARCH, INC., AURORA, ILL.
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[PB85-149706] N85-21314

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[PB85-149763] N85-21530

ENGINEERING DEVELOPMENT ESTABLISHMENT, MARIBYRNONG (AUSTRALIA).
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[AD-A149626] N85-21664

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[PB85-126043] N85-21836
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[PB85-126068] N85-21838

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[AD-A149963] N85-21698

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Scan angle and detector effects in Thematic Mapper radiometry N85-21735
Thematic Mapper spectral dimensionality and data structure N85-21736
Investigations of vegetation and soils information contained in LANDSAT Thematic Mapper and Multispectral Scanner data
[E85-10062] N85-21747

ENVIRONMENTAL RESEARCH LAB., DULUTH, MINN.
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[PB85-116077] N85-21829
Role of biological assessment in effluent control
[PB85-116101] N85-21830
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[PB85-137339] N85-21841

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Stochastic convective-dispersive transport model for wastes disposed at the 106-mile ocean disposal site
[PB85-116176] N85-21831

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Optimization of silicon-nitride-inversion layer solar cells N85-21784

EROS DATA CENTER, SIOUX FALLS, S. DAK.
Geodetic accuracy of LANDSAT 4 Multispectral Scanner and Thematic Mapper data N85-21746
LANDSAT 4 investigations of Thematic Mapper and Multispectral Scanner applications
[E85-10095] N85-21757

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Plasma Astrophysics
[ESA-SP-207] N85-22270

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A preliminary analysis of LANDSAT-4 Thematic Mapper radiometric performance N85-21730
TM geometric performance: Line to Line Displacement Analysis (LLDA) N85-21732

F

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Proceedings of the 6th Human Factors Workshop on Aviation
[AD-A150043] N85-21962

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Suppression and control of Class C cargo compartment fires
[FAA/CT-84-21] N85-21133

FEDERAL COMPILER TESTING CENTER, FALLS CHURCH, VA.
Ryan-McFarland Corporation, IBM PC model XT, RM/FORTRAN, version 2.0.0
[PB85-107993] N85-22037
Ryan-McFarland Corporation, sun microsystem with sky fast floating point processor, RM/FORTRAN version 1.5.0
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FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
New preamplifier for particle detectors
[DE85-004115] N85-21524
Superconducting magnet technology for accelerators
[DE85-004192] N85-22102

FINNISH METEOROLOGICAL INST., HELSINKI.
Distribution of atmospheric electric current in the global circuit
[CONTRIB-87] N85-21852
On the wind error of the Finnish raingauge
[REPT-37] N85-21883

FLIGHT SYSTEMS, INC., NEWPORT BEACH, CALIF.
Dual band radome wall design
[AD-P004357] N85-21451

FLORIDA STATE UNIV., TALLAHASSEE.
Research in theoretical nuclear physics
[DE85-004349] N85-22137

FLORIDA UNIV., GAINESVILLE.
Jet topologies in hadron-hadron collisions
[DE85-001328] N85-22119

FLOW RESEARCH, INC., KENT, WASH.
Unsteady flows around 3-dimensional wings
[AD-A149993] N85-21124
Pseudospectral calculations of two-dimensional transonic flow (Task 1). Numerical investigation of VTOL aerodynamics (Task 2)
[AD-A150123] N85-21126

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Technology of thin silicon foils for the fabrication of monolithic integrated sensors
[BMFT-FB-T-84-209] N85-22202

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Attitude data consistence check of rocket payloads
[BMFT-FB-W-84-049] N85-21239
Experiment for measuring electric fields within the sounding rocket project Energy Budget
[BMFT-FB-W-84-048] N85-21866

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Development of new process technologies for solar cells with high efficiency starting from purified silicon N85-21785

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[BMFT-FB-W-84-045] N85-21227

FRENCH AIR FORCE, PARIS.
Statistics of french Armee de l'air ejections 1970 - 1980 N85-21971
The clinical and radiological assessment of cervical injury, Annex A N85-21976

FURMAN UNIV., GREENVILLE, S.C.
Using a data base management system for modelling SSME test history data N85-22211

G

GA TECHNOLOGIES, INC., SAN DIEGO, CALIF.
Intensified CCD camera system for plasma diagnostics
[DE85-002252] N85-21620
Determination of experimental Tokamak plasma properties using maximum entropy analysis
[DE85-001723] N85-22165

GENERAL DYNAMICS CORP., SAN DIEGO, CALIF.
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[AD-P004351] N85-21445

GENERAL ELECTRIC CO., FAIRFIELD, CONN.
In situ orbital debris experiment concepts N85-21198
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
The 60 GHz antenna system analyses for intersatellite links, phase A
[NASA-CR-175285] N85-21439
Design and calibration of a 35GHz dielectrometer
[AD-P004363] N85-21457
GENERAL ELECTRIC CO., PITTSFIELD, MASS.
Study of electric field and ion effects on HVDC lines
[DE85-002975] N85-21503
Electrical characterization of analog microprocessors
[AD-A149629] N85-21995
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
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[PB85-149696] N85-21313
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[DE85-002736] N85-22101
GENERAL RESEARCH CORP., MCLEAN, VA.
Applications of Tethers in Space
[NASA-CP-2368] N85-21659
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Intraband radiometric performance of the LANDSAT 4 Thematic Mapper N85-21738
Tests of low-frequency geometric distortions in LANDSAT 4 images N85-21744
GEOLOGICAL SURVEY, RESTON, VA.
A preliminary evaluation of LANDSAT-4 Thematic Mapper data for their geometric and radiometric accuracies N85-21739
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[AD-P004352] N85-21446
Near-field effects on radome boresight errors
[AD-P004356] N85-21450
Modeling of transient heat pipe operation
[NASA-CR-175496] N85-21571
Flow measurement by laser Doppler anemometry in a nuclear fuel assembly
[DE85-003260] N85-21592
A note on validity generalization procedures
[AD-A150065] N85-22085
Investigation of the effects of NaOH dopant level on the physical and mechanical properties of carbon/phenolic composite material N85-22213
GEORGIA UNIV., ATHENS.
Physiography of the Martian west equatorial uplift N85-22325
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[NASA-CR-175511] N85-22326
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GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
An investigation of turbulence mechanisms in V/STOL upwash flow fields
[AD-A149786] N85-21123
Satellite services and orbital retrieval N85-21211
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[AD-P004370] N85-21464
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[AD-P004367] N85-21461

H

HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
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[DE85-001068] N85-21339
HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS, CAMBRIDGE, MASS.
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HARVARD UNIV., CAMBRIDGE, MASS.
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[AD-A150091] N85-21711
HAWAII UNIV., HONOLULU.
Development and application of low energy X-ray and electron physics
[AD-A149983] N85-22099
HAWAII UNIV., MANOA.
A concatenated coding scheme for error control
[NASA-CR-175504] N85-22001
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[PB85-120848] N85-21930
HELIOTRONIC G.M.B.H., BURGHAUSEN (WEST GERMANY).
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Materials refining for solar cell silicon N85-21775
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Rates of convergence of semistochastic approximation procedures for solving stochastic optimization problems N85-22088
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[DE84-009291] N85-21763
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[NASA-CR-175512] N85-21661

I

IBM RESEARCH LAB., SAN JOSE, CALIF.
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[AD-A149745] N85-21287
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[AD-A149751] N85-21288
The effect of Xe underlayers on the surface enhanced Raman scattering of pyridine on cold silver
[AD-A150109] N85-21294
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[AD-A150111] N85-21295
IDAHO NATIONAL ENGINEERING LAB., IDAHO FALLS.
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[DE85-004322] N85-21670
IIT RESEARCH INST., CHICAGO, ILL.
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[AD-A149756] N85-21367
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Multi-sample cluster analysis as an alternative to multiple comparison procedures
[AD-A149960] N85-22084
ILLINOIS UNIV., URBANA.
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[NASA-CR-175586] N85-21283
Numerical methods for analyzing electromagnetic scattering
[NASA-CR-175507] N85-21438
Concurrent simulation techniques exploiting hierarchy
[AD-A149783] N85-21512
Design of a bit-sliced processor array with built-in-self-test
[AD-A149785] N85-21513
Rocket observations of the ionosphere during the eclipse of 26 February 1979
[NASA-CR-175513] N85-21850
An improved rocket-borne electric field meter for the middle atmosphere
[NASA-CR-175510] N85-21851
Built-in tests for VLSI (Very Large Scale Integration) finite-state machines
[AD-A149784] N85-21997
Characterization of high purity Si-doped molecular beam epitaxial GaAs
[AD-A149651] N85-22181
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[NASA-CR-3866] N85-21166
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[REPT-615] N85-21229
Development of Faraday cup onboard MS-T5 for solar wind measurements
[REPT-616] N85-21255
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[REPT-613] N85-21578
Variable geometry truss concept
[REPT-614] N85-21697
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Arguments for fundamental emission by the parametric process L yields T + S in interplanetary type III bursts N85-22311
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J

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[NASA-CASE-NPO-16336-1-CU] N85-21407
Multicomputer communication system
[NASA-CASE-NPO-15433-1] N85-21428
Hollow cathode apparatus
[NASA-CASE-NPO-15560-1] N85-21491
Method and apparatus for self-calibration and phasing of array antenna
[NASA-CASE-NPO-15920-1] N85-21493
State-of-charge coulometer
[NASA-CASE-NPO-15759-1] N85-21596
Carbon granule probe microphone for leak detection
[NASA-CASE-NPO-16027-1] N85-21597
Portable remote laser sensor for methane leak detection
[NASA-CASE-NPO-15790-1] N85-21631
Ingot slicing machine and method
[NASA-CASE-NPO-15483-1] N85-21650
Apparatus and method to keep the walls of a free-space reactor free from deposits of solid materials
[NASA-CASE-NPO-15851-1] N85-21652
NASA welding assessment program
[NASA-CR-175512] N85-21661
Method of measuring sea surface water temperature with a satellite including wideband passive synthetic-aperture multichannel receiver
[NASA-CASE-NPO-15651-1] N85-21723
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[NASA-CASE-NPO-15430-1] N85-21846
Chemical kinetics and photochemical data for use in stratospheric modeling. Evaluation number 6
[NASA-CR-175564] N85-21849
Automatic multi-banking of memory for microprocessors
[NASA-CASE-NPO-15295-1] N85-21992
Acoustic agglomeration methods and apparatus
[NASA-CASE-NPO-15466-1] N85-22104
High temperature acoustic levitator
[NASA-CASE-NPO-16022-1] N85-22105

Focal plane array optical proximity sensor [NASA-CASE-NPO-15155-1] N85-22139
Total immersion crystal growth [NASA-CASE-NPO-15800-2] N85-22178
JPL highlights, 1983 [NASA-CR-175558] N85-22256
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Aviation repair plant directors on quality control measures N85-21106
New flight simulators at Vnukovo permit less in-flight training N85-21107
New runway enables IL-76 flights to Tenkeli in far north N85-21108
Current development, applications of airships in USSR N85-21109
China report: Science and technology [JPRS-CST-85-008] N85-21416
Distance-inertial guidance of launch vehicle described N85-21417
Systems research on China in year 2000 N85-21418
Potential at atomic boundaries in the TF (or TFD) model and equations of states N85-21419
Waveform control and application of detonation wave in explosives N85-21420
Photoacoustic effect and its applications N85-21421
Compensation of skew passband of a SAW filter using predistortion N85-21422
A calculation of slender delta wing with leading-edge separation by quasi-vortex-lattice method N85-21423
Calculation of the flow around thick wings with separation vortices N85-21424
The split-coefficient matrix method for supersonic three dimensional flow N85-21425
An experimental investigation of flap turbulent heat transfer and pressure characteristics in hypersonic flow N85-21426
USSR report: Electronics and electrical engineering [JPRS-UEE-85-004] N85-21531
Tubes and transistors in audio amplifiers N85-21532
Radioelectronics and space exploration N85-21533
Satellite communications and amateur radio N85-21534
Automatic pickup of trajectory by method of sequential analysis taking into account deviation of radar markers from center of strobe N85-21535
Performance ranges of helical antenna made of conductor with extra bends N85-21536
Operating time meter for tape recorder N85-21537
Quartz filter transceiver N85-21538
Summator of radio pulse signals N85-21539
High-frequency input device for superheterodyne radio receiver with wideband preselector N85-21540
Synthesis of optimum receiver and processor for signal packet of radio pulses N85-21541
Device for controlling operation of lithicon cathode-ray memory tube N85-21542
Estimating algorithmic error of digital recursive filters N85-21543
Wideband phase keyers N85-21544
Synthesis of digital nonrecursive band-elimination filters for moving-target selectors N85-21545
Method of designing digital band-pass filters with infinite memory N85-21546
Optimal threshold and weight sorting of elevation angle readings under conditions of fadeouts of a directed signal N85-21547
Multichannel digital processing of wideband signals N85-21548
Digital detector of harmonic signals N85-21549
Optimal discrete filtration of intricate phase-keyed signals N85-21550
Adaptive regulation of transmitter radiation power in radio lines during delays of control signals N85-21551
Simulation of thermal and electromagnetic processes in induction plasmatrons N85-21552
Reducing electric power losses in discharge chamber of induction plasmatron N85-21553
Characteristics of multiarc plasma devices N85-21554
Computer simulation of equipment and processes involved in high-frequency heating of dielectrics N85-21555
Transistor-transistor logic microcircuit tester N85-21556
Redundancy of codes for detection and correction of unidirectional errors N85-21557
Program for controlling electrical measuring contact instrument on glow-discharge indicator panel N85-21558
Determining distribution of complex dielectric permittivity over cylindrical body of intricate cross section from electromagnetic field measurement N85-21559
Algorithm for statistical simulation of electromagnetic compatibility characteristics of high-frequency transmission channels in radioelectronic facilities N85-21560
Control of nonlinear objects N85-21561
Synthesis of digital control for object with lag N85-21562
Magnetic field in main gap of separator N85-21563
Behavior of small ferromagnetic particles in traveling magnetic field N85-21564
Mathematical simulation of thermal processes involved in electron-beam treatment N85-21565
New types of power supplies for ultrasonic processing equipment N85-21566
Method of calculating cooldown process in cryostat of cryogenic electric machine N85-21567
USSR report: Space Biology and Aerospace Medicine, volume 18, no. 6, November - December 1984 [JPRS-USB-85-002] N85-21931
External respiration, gas exchange and energy expenditures of man in weightlessness N85-21932
Blood amino acids of cosmonauts before and after 211-day spaceflight N85-21933
Circadian rhythm of human body temperature during spaceflights N85-21934
Biochemical status of adrenocortical dysfunction following spaceflight N85-21935
Comparative analysis of effects of weightlessness and its models on velocity and strength properties and tone of human skeletal muscles N85-21936
Cosmonauts' blood plasma free amino acid levels during preflight training N85-21937
LBNP training of crew members on main missions aboard Salyut-6 orbital station N85-21938
Main component method used to study variations of cardiovascular parameters N85-21939
Role of mental work in human tolerance in total-body vibration N85-21940
Human lung fluid content during 7-day head-down tilt N85-21941
Morphological study of monkeys submitted to antiorthostatic hypokinesia N85-21942
Fluid metabolism of monkeys during two-week antiorthostatic hypokinesia N85-21943
Distinctive morphological manifestations of acute stress reaction in adrenal cortex of hypokinetic rats N85-21944
Preventive effect of acute heat factors during hypokinesia N85-21945
Investigation of adaptive distinctions of mechanism of controlled glycemia in Macaca rheseus monkeys N85-21946
Multiple regression method used to assess animal adaptation to hypoxic hypoxia N85-21947
Effect of high ammonia content in closed environment on some parameters of human nitrogen and carbohydrate metabolism against background of a controlled diet N85-21948
Model of information-reference dialogue system for working with document abstracts N85-21949
Spirolit-2 instrument used to test pulmonary ventilation N85-21950
Parameters of carbohydrate metabolism and blood serum enzyme activity after short-term spaceflights N85-21951
Results of sanitary-microbiological studies aboard Cosmos-1129 biosatellites N85-21952
Dynamics of quantitative and qualitative changes in conditionally pathogenic microflora of the human intestine during long-term hypokinesia N85-21953
Rat tissue opioid peptide content during long-term hypokinesia N85-21954
Effect of long-term repeated exposure to high-intensity stationary magnetic field on adrenomedullary activity N85-21955

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Effect of stationary magnetic field on bleeding time N85-21956
Review of US manual of clinical aviation medicine N85-21957
Review of US guide on medication and flying N85-21958

K

KAISERSLAUTERN UNIV. (WEST GERMANY).
Thin-film solar cells from sputtered and vapor-deposited amorphous silicon N85-21792

KANSAS UNIV. CENTER FOR RESEARCH, INC., LAWRENCE.
The 13.9 GHz radiometer design [AD-A149637] N85-21613

KARLSRUHE UNIV. (WEST GERMANY).
Development of miniature laser Doppler anemometers [KU-SFB-210/ET/3] N85-21648

KATHOLIEKE UNIVERSITEIT TE LEUVEN (BELGIUM).
The continuous spectrum of an axisymmetric, self-gravitating equilibrium in the presence of a poloidal magnetic field N85-22315

KENTUCKY UNIV., LEXINGTON.
Theoretical studies on N-bonded pyrazole derivatives of boron [AD-A150036] N85-21374
Non-contacting electromagnetic de-spin system for Earth orbiting satellites N85-22225

KHARKOV STATE UNIV. (USSR).
Drift-accretion theory of the spiral structure of galaxies N85-22296

KLOECKER-WERKE A.G., BREMEN (WEST GERMANY).
New application possibilities for clad steel by reducing surface treatment expenditure and by using improved welding technology [BMFT-FB-T-84-236] N85-21672

KNOLLS ATOMIC POWER LAB., SCHENECTADY, N. Y.
Continuous measurement of zircaloy corrosion in air with an ultrasonic corrosion monitor [DE85-003663] N85-21337

KONSTANZ UNIV. (WEST GERMANY).
Development of new solar cells N85-21797

L

LAMBUTH COLL., JACKSON, TENN.
The intelligent database machine N85-22242

LAVAL UNIV. (QUEBEC).
The luminosity distribution of pulsars N85-22317

LEHIGH UNIV., BETHLEHEM, PA.
Degradation mechanisms in ceramic dielectrics [AD-A149791] N85-21369
Interaction of part-through cracks in a flat plate [NASA-CR-175588] N85-21692

LIBRARY OF CONGRESS, WASHINGTON, D. C.
The availability of Japanese scientific and technical information in the United States [GPO-39-478] N85-22254

LIGHTNING TECHNOLOGIES, INC., PITTSFIELD, MASS.
Direct-strike lightning photographs, swept-flash attachment patterns, and flight conditions for storm hazards 1982 [NASA-TM-86347] N85-21877

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Collision avoidance for Naval training aircraft [FAA/PM-84-4] N85-21136

LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS.
Determination of toxicity of combustion products of habitability foams concurrently with flammability studies of these materials [AD-A149647] N85-21961

LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.
Investigation of TM band-to-band registration using the JSC registration processor N85-21745

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
STS atmospheric luminosities [NASA-CR-175514] N85-21240
SCATHA (spacecraft charging at high altitudes) plasma interaction experiment: SC-3 high energy particle spectrometer; SC-8 energetic ion composition experiment [AD-A149728] N85-21252
S3-3 ONR-118 data analysis [AD-A149725] N85-21855

LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Simple EOS for the silicone rubber Sylgard 184 [DE85-001394] N85-21378
High-temperature-stable detonators [DE85-005188] N85-21402
Nonprimary-explosive, hot-wire detonator [DE85-005195] N85-21403

Aerosol multiple-scanning code, ASCAT
[LA-10046-MS] N85-21440
TRACR3D: A model of flow and transport in porous/fractured media
[LA-9967-MS] N85-21576
Front tracking and two dimensional Riemann problems: A conference report
[DE85-002209] N85-21589
X-ray gauge measures areal density variations as small as 0.1%
[DE85-003774] N85-21629
Transmission and reflection of laser beams propagating through aerosol clouds in space
[LA-9998-MS] N85-21636
Substorms in the Earth's atmosphere
[DE85-000654] N85-21861
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862
A 3-D treatment of convective flow in the Earth's mantle
[DE85-003734] N85-21863
Los Alamos MINI-Review: Tracking Antarctic winds
[DE85-004597] N85-21903
Computing Division two-year operational plan, FY 1984 - 1985
[LA-9978-MS] N85-22006
The liner package: An incipient MHD capability for CCUBE
[LA-9969-MS] N85-22007
A linear characteristic-nodal transport method for the two-dimensional (X,Y)-geometry multigroup discrete ordinates equations over an arbitrary triangle mesh
[LA-10092-T] N85-22008
User's guide for TWODANT: A code package for two-dimensional, diffusion-accelerated, neutral-particle transport
[LA-10049-M] N85-22009
ZTL: A subroutine package for the IBM personal computer to support the Zlatech ZT1488 IEEE-488 controller
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[LA-9938-MS] N85-22011
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[LA-10142-MS] N85-22012
A subroutine package for the IBM personal computer to support the Hercules Graphic Card
[LA-10144-MS] N85-22013
ZTLCK: A subroutine package for the IBM personal computer to support the Zlatech ZT1488 real time clock
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[LA-10145-MS] N85-22015
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[LA-10104-M] N85-22018
EZPIX: A tablet entry method for computer-generated slides, drawings, and graphs
[DE85-005234] N85-22030
Characterizing the parallelism in rule-based expert systems
[DE85-002432] N85-22047
Numerical methods for tracking interfaces
[LA-9917-MS] N85-22052
Low-dimensional behavior of the pattern formation Cahn-Hilliard equation
[DE85-003727] N85-22072
Sound velocity of carbon at high pressures
[DE85-002016] N85-22113
User's guide for TWOHEX: A code package for two-dimensional, neutral-particle transport in equilateral triangular meshes
[DE85-004482] N85-22125
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 4
[LA-10217-SR] N85-22128
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 5
[LA-10232-SR] N85-22129
General-purpose heat source development: Safety test program. Postimpact evaluation, design iteration test 1
[LA-9660-SR] N85-22131
Irradiation effects on fuels for space reactors
[DE84-016460] N85-22134
Research and development related to the Nevada nuclear waste storage investigations
[DE85-002303] N85-22138
The UFe4P12 and CeFe4P12: Non-metallic isotopes of superconducting LaFe4P12
[DE85-003724] N85-22195

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
Analytically redundant output feedback scheme for reduction of structural loads of a flexible transport aircraft
[TT-8303] N85-21154
A note on the use of polynomial transformations in evaluating singular integrals
[MATHEMATICS-RESEARCH-165] N85-22053
The implementation of the Tanh transformations in the evaluation of singular integrals
[MATHEMATICS-RESEARCH-171] N85-22054
Predicting a future response using rank predictive probabilities
[MATHEMATICS-RESEARCH-166] N85-22077
Inference for censored matched pairs using signed ranks
[MATHEMATICS-RESEARCH-162] N85-22078
Simplifications and approximations for linear rank statistics with censored data
[MATHEMATICS-RESEARCH-161] N85-22079
Proportional odds models for survival data and estimates using ranks
[MATHEMATICS-RESEARCH-172] N85-22080
Use of ranks to fit a linear model to cross-sectional data with an application to biological rhythms
[MATHEMATICS-RESEARCH-169] N85-22081

LOWELL UNIV., MASS.
Studies of the development of cyclones over Southern China coastal areas and adjacent seas
[AD-A150108] N85-21901

M

M/A-COM DDC, INC., GERMANTOWN, MD.
Digital channel efficiency model
[AD-A150084] N85-21479

MAGNAVOX ADVANCED PRODUCTS AND SYSTEMS CO., TORRANCE, CALIF.
Fundamental limits to synchronization and tracking
[AD-A149623] N85-21504

MARBURG UNIV. (WEST GERMANY).
Production and characterization of amorphous silicon (a-Si:H) as base material for solar cells N85-21791

MARTIN MARIETTA AEROSPACE, DENVER, COLO.
Atmospheric dispersion of hypergolic liquid rocket fuels, volume 1
[AD-A149597] N85-21399

MARYLAND UNIV., COLLEGE PARK.
Life study of RF excited Hg arc lamps and CO2 waveguide lasers
[AD-A149618] N85-21640
A new model for thin plates with rapidly varying thickness. Part 3: Comparison of different scalings
[AD-A149748] N85-21704
Thermophysical properties of working fluids for binary geothermal cycles
[DE85-000385] N85-21804
Determining conductivity by boundary measurements. Part 2: Interior results
[AD-A149750] N85-22063
Parallel processing of encoded bit strings
[AD-A149612] N85-22064

MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., MUNICH (WEST GERMANY).
Solar process heat: Technology program
[BMFT-FB-T-84-234] N85-21812

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A theory of post-stall transients in multistage axial compression systems
[NASA-CR-3878] N85-21117
Advanced stress analysis methods applicable to turbine engine structures
[NASA-CR-175573] N85-21165
Exploration of new methods to produce efficient sources of coherent near millimeter wave radiation
[AD-A150094] N85-21481
Mechanisms of heat and mass transfer across a double-diffusive interface
[PB85-148468] N85-21594
Application of homomorphic signal processing to stress wave factor analysis N85-21673
Recent advances in hybrid/mixed finite elements
[NASA-CR-175574] N85-21687
A solution method for large deformation contact problems
[AD-A149842] N85-21707
A solution method for nonlinear dynamic analysis of shell structures
[AD-A149846] N85-21708
Instrumentation award
[AD-A150081] N85-21999
Distributed asynchronous deterministic and stochastic gradient optimization algorithms: Revision
[AD-A149997] N85-22068
Asymptotics for configural estimators
[AD-A150106] N85-22087
Switchable zero order diffraction gratings as light valves
[AD-A150129] N85-22153
Investigation of device and electronic interactions in GaAs device processing
[AD-A149747] N85-22182
Study of energy versus misorientation for grain boundaries in gold by crystallite rotation method. 1: 001 twist boundaries
[DE85-004598] N85-22201
Problems in decentralized decision making and computation
[AD-A150025] N85-22251
Discovery of the solar wind N85-22272
Magnetospheres in the solar system N85-22274
On a spectral theory of the excitation mechanism of galactic spirals N85-22284
X-ray astronomy and plasma astrophysics N85-22288

MASSACHUSETTS UNIV., AMHERST.
Integrating non-semantic knowledge into image segmentation processes
[AD-A149571] N85-21612
Processing dynamic image sequences from a moving sensor
[AD-A149984] N85-22148

MATERIALS RESEARCH LABS., ASCOT VALE (AUSTRALIA).
Interactions between F-111 fuselage fuel tank sealants. Part 2: Variation in performance properties of polysulfides after contact with polyester degradation products
[AD-A149777] N85-21368
A 50-kW electric-discharge CO2 laser
[AD-A149779] N85-21644

MATHEMATICAL SCIENCES NORTHWEST, INC., BELLEVUE, WASH.
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[DE84-010931] N85-21772

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Velocity distributions of solar wind ions and electrons N85-22273

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Investigation of the development possibilities of a ferritic creep and oxidation-resistant steel for application under creep conditions above 650 deg C
[BMFT-FB-T-84-244] N85-21344

MAX-PLANCK-INST. FUER KERNPHYSIK, HEIDELBERG (WEST GERMANY).
Self-similar modified shock structures N85-22290

MEGAPULSE, INC., BEDFORD, MASS.
Survivable propagation
[AD-A150070] N85-21478

MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., OTTOBRUNN (WEST GERMANY).
Sounding rocket program Aeronomie. The payload M-I in the project MAP-WINE
[BMFT-FB-W-84-046] N85-21236
Development of an amorphous silicon panel N85-21788

METEOROLOGICAL RESEARCH INST., TOKYO (JAPAN).
On the P1 data from GMS-SEM N85-21890

METEOROLOGICAL SATELLITE CENTER, TOKYO (JAPAN).
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[MSC-TN-10] N85-21884
On the relative motion of typhoons: In the case of Typhoon 8305 and Typhoons 8306 and 8307 N85-21885
Accuracy of typhoon center determined by GMS imagery N85-21887
An analysis of the data obtained by a simultaneous observation of GMS and GMS-2: A study of the difference between the brightness temperatures by GMS and those by GMS-2 N85-21888
VISSR infrared calibration by means of calculated radiances N85-21889
The development of image processing of NOAA AVHRR data and its application to sea surface temperature N85-21891
A supplement study on the subsynoptic cloud system off the south coast of Japan N85-21892
GMS operational calibration procedure and status N85-21893

MIAMI UNIV., CORAL GABLES, FLA.
Electromagnetic rail launcher as a circuit element
[AD-A150067] N85-21516

MIAMI UNIV., FLA.
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862

MICHIGAN STATE UNIV., EAST LANSING.
Design issues in video disc map display
[AD-A149646] N85-21760
MICHIGAN UNIV., ANN ARBOR.
In-beam tests of an air-core superconducting-solenoid particle spectrometer
[DE85-004029] N85-21625
SIMULA: Digital controller simulation package
[PB85-134492] N85-22041
MIDDLE EAST TECHNICAL UNIV., ANKARA (TURKEY).
A subaperture approach to the calculation of flashlobes introduced by airborne radomes
[AD-P004355] N85-21449
MIDDLE TENNESSEE STATE UNIV., MURFREESBORO.
Germanium resistance thermometer calibration at superfluid helium temperatures N85-22228
MIDWEST RESEARCH INST., GOLDEN, COLO.
Effect of ultraviolet radiation on transparent polymer films as determined using in situ FTIR-RA spectroscopy. Volume 1: Photodegradation of transparent polymer films
[DE84-013039] N85-21377
Improvements in glazings: SERI materials research in progress
[DE84-013049] N85-21378
Computer analysis of wind turbine blade dynamic loads
[DE85-000530] N85-21714
A summary and assessment of historical reliability and maintainability data for solar hot water and space conditioning systems
[DE84-004521] N85-21770
Direct-contact condensers for solar pond power production
[DE84-004510] N85-21771
Experimental study of steam condensation on water in countercurrent flow in presence of inert gases
[DE84-013028] N85-21800
Aerodynamic research efforts at SERI Wind Energy Research Center at Rocky Flats
[DE85-000529] N85-21805
MILAN UNIV. (ITALY).
The influence of the local solar wind structures on the propagation of low energy particles N85-22314
Discriminant analysis of pulsar groups in the diagram P versus P N85-22319
Pulsars and interstellar medium N85-22320
MINNESOTA UNIV., MINNEAPOLIS.
Studies of silicon-refractory metal interfaces: Photoemission study of interface formation and compound nucleation
[AD-A150075] N85-21293
MISSION RESEARCH CORP., ALBUQUERQUE, N. MEX.
Theoretical study of collective ion acceleration in the Luce diode
[AD-A150107] N85-22116
MISSISSIPPI STATE HIGHWAY DEPT., JACKSON.
Evaluation of Epoxo 300-C nonskid coating for use on bridge decks
[PB85-108843] N85-21412
MISSISSIPPI STATE UNIV., STATE COLLEGE.
Reliability of structural brittle materials N85-22222
MISSISSIPPI UNIV., UNIVERSITY.
Evaluation of resonant modes in isolated dielectric resonators using a surface integral equation formulation
[PB85-110831] N85-21528
MISSOURI UNIV., COLUMBIA.
Inelastic scattering in condensed matter with high intensity Moessbauer radiation
[DE85-003531] N85-21627
MISSOURI UNIV., ROLLA.
Characterization of high temperature electrically conducting oxides
[DE85-004296] N85-21307
MONSANTO RESEARCH CORP., MIAMISBURG, OHIO.
Proton NMR and susceptibility measurements in TiCoH/sub x
[DE85-003309] N85-21336
MOUND LAB., MIAMISBURG, OHIO.
Fast times at high temperatures
[DE85-003306] N85-22205
MULTIDISCIPLINARY ENERGY AND ENVIRONMENTAL SYSTEMS AND APPLICATIONS, TORRANCE, CALIF.
Assessment of hazardous waste surface impoundment technology case studies and perspectives of experts
[PB85-117059] N85-21834

N

NAGOYA UNIV. (JAPAN).
Suppression of tilting instability of a compact torus by energetic particle beams
[IPPJ-705] N85-22157
Heat flux in Lorentzian plasma
[IPPJ-704] N85-22158
Reconsideration of sheath related to negative ion extraction
[IPPJ-706] N85-22159
Efficient heating and confinement of ions in an axisymmetric magnetic mirror supplemented with dc electric field
[IPPJ-707] N85-22160
Strong iron accelerating by collisionless magnnetosonic shock wave propagating perpendicular to a magnetic field
[IPPJ-709] N85-22161
Observations of bulk electron heating due to return current in a tokamak discharge started up by lower hybrid waves
[IPPJ-708] N85-22172
NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Computer integration of engineering design and production: A national opportunity
[NASA-CR-175483] N85-21414
Automatic speech recognition in severe environments
[PB85-121697] N85-21490
Global tropospheric chemistry: A plan for action
[NASA-CR-175545] N85-21865
Research and Modeling of Supervisory Control Behavior, report of a workshop
[AD-A149621] N85-22248
Computational mechanics: A perspective on problems and opportunities for increasing productivity and quality of engineering
[PB85-128106] N85-22252
NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA (ONTARIO).
Skin friction measurements for 2 relatively thick airfoil sections at high Reynolds number
[AD-A150021] N85-21125
A history of full-scale testing of aircraft structures at the National Aeronautical Establishment
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Unsteady aerodynamic characterization of a military aircraft in vertical gusts
[NASA-TM-77810] N85-21110
Three-dimensional unsteady lifting surface theory in the subsonic range
[NASA-TM-77812] N85-21111
Aerospace Safety Advisory Panel
[NASA-TM-87428] N85-21135
Towards a renewal of the propeller in aeronautics
[NASA-TM-77803] N85-21169
The international environment UNISPACE '82 and the ITU: A relationship between orbit-spectrum resource allocation and orbital debris N85-21215
The space flight of the Soviet-Indian crew
[NASA-TM-77615] N85-21226
An air-breathing ballistic space transporter for Europe
[NASA-TM-77645] N85-21244
Space Station
[NASA-EP-211] N85-21251
Slip casting and nitridation of silicon powder
[NASA-TM-77809] N85-21406
Characteristics of the boat inductor for keeping liquid metal in the suspended state
[NASA-TM-77816] N85-21611
A deformation analysis of flat flexible gear and its equation of original curved surfaces
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An open-ended future: In defense of a new humanism
[NASA-TM-77613] N85-22209
Planetary cartography in the next decade (1984 - 1994)
[NASA-SP-475] N85-22323
The international VEGA 'Venus-Halley' (1984-1986 experiment: Description and scientific objectives
[NASA-TM-77536] N85-22324
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Reconstruction of a 3-dimensional transonic rotor flow field from holographic interferogram data
[NASA-TM-86690] N85-21112
Transonic interactions of unsteady vortical flows
[NASA-TM-86658] N85-21113
A Lagrange-D'Alembert formulation of the equations of motion of a helicopter carrying an externally suspended load
[NASA-TM-85864] N85-21149
Analytical and flight investigation of the influence of rotor and other high-order dynamics on helicopter flight-control system bandwidth
[NASA-TM-86696] N85-21174
Impacts of Space Shuttle thermal protection system tile on F-15 aircraft vertical tile
[NASA-TM-85904] N85-21245
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-2] N85-21347
Phthalocyanine polymers
[NASA-CASE-ARC-11413-1] N85-21348
Metal (11) 4,4',4',4''-phthalocyanine tetraamines as curing agents for epoxy resins
[NASA-CASE-ARC-11424-1] N85-21361
Fire resistant polymers based on 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diamino benzenes
[NASA-CASE-ARC-11512-2] N85-21362
Fire-resistant phosphorus containing compounds, polyimides and copolyimides
[NASA-CASE-ARC-11522-2] N85-21363
Fire and heat resistant laminating resins based on maleimido and citraconimido substituted 1-(diorgano oxyphosphonyl)methyl-2,4- and 2,6-diaminobenzenes
[NASA-CASE-ARC-11533-1] N85-21364
Application of large eddy interaction model to channel flow
[NASA-TM-86691] N85-21572
Assessment of Thematic Mapper band-to-band registration by the block correlation method N85-21743
Research and technology activities at Ames Research Center's Biomedical Research Division
[NASA-TM-86692] N85-21925
Shoulder and hip joint for hard space suits and the like
[NASA-CASE-ARC-11543-1] N85-21986
Torso sizing ring construction for hard space suit
[NASA-CASE-ARC-11616-1] N85-21987
1985 Resident research associateships: Postdoctoral and senior research awards
[NASA-TM-87458] N85-22336
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Debris in the geostationary orbit ring, the endless shooting gallery: The necessity for a disposal policy N85-21214
Method and apparatus for mapping the distribution of chemical elements in an extended medium
[NASA-CASE-GSC-12808-1] N85-21279
Magentically actuated compressor
[NASA-CASE-GSC-12799-1] N85-21404
GSFC specification electronic data processing magnetic recording tape
[NASA-TM-80599] N85-21609
Method of and apparatus for measuring temperature and pressure
[NASA-CASE-GSC-12558-1] N85-21639
LANDSAT-4 Science Characterization Early Results. Volume 3, part 2: Thematic Mapper (TM)
[E85-10069] N85-21724
Relative radiometric calibration of LANDSAT TM reflective bands N85-21725
Thermal band characterization of the LANDSAT-4 Thematic Mapper N85-21727
21 Layer troposphere-stratosphere climate model
[NASA-TM-86183] N85-21871
Particle transport in planetary magnetospheres N85-22275
Neutron and gamma-ray signatures for particle acceleration in solar flares N85-22278
Signatures of the coalescence instability in solar flares N85-22293
Electron-positron pair equilibrium in strongly magnetized plasmas N85-22296
Research and technology: Fiscal year 1984 report
[NASA-TM-85231] N85-22340
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Orbital Debris
[NASA-CP-2360] N85-21186
NORAD's PARCS small satellite tests (1976 and 1978) N85-21191
NASA/JSC orbital debris study: Debris model N85-21193
Proposed preliminary design criteria model environment for the 1990's N85-21194
Use of ground radar to detect reentering debris N85-21200
Particle size, number, composition and velocity from solid rocket motors N85-21201
Hypervelocity impacts on Skylab 4/Apollo windows N85-21202
Survey of probable micrometer-sized Earth-orbital debris fragments in the NASA-JSC cosmic dust sample collection N85-21203

Impacts on Explorer 46 from an Earth orbiting population N85-21204
In-situ detection of micron-sized dust particles in near-Earth space N85-21205
Hypervelocity impact investigations and meteoroid shielding experience related to Apollo and Skylab N85-21206
Solid particle environment and protection for the Galileo Orbiter N85-21207
Parametric analysis: SOC meteoroid and debris protection N85-21209
Space heat rejection radiators: Meteoroid/debris consideration N85-21210
Considerations for policy on man-made debris propagation control N85-21219
Environment definition, large particles N85-21220
Modeling N85-21221
Measurements N85-21222
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Spacecraft hazard and shielding requirements N85-21224
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[NASA-TP-2413] N85-21120
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[NASA-CASE-LAR-12979-1] N85-21147
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[NASA-CASE-LAR-13014-1] N85-21178
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[NASA-TM-86355] N85-21270
Elastomer toughened polyimide adhesives
[NASA-CASE-LAR-12775-2] N85-21349
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[NASA-CASE-LAR-13351-1] N85-21360
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[AD-A149598] N85-22110
NORTH GEORGIA COLL., DAHLONEGA.
Models of the upper atmosphere N85-22217
NORTHEASTERN UNIV., BOSTON, MASS.
Alloy development, processing and characterization of devitrified titanium base microcrystalline alloys
[AD-A149609] N85-21327
Application of the system identification technique to goal-directed saccades
[AD-A150132] N85-21967
NORTHROP CORP., HAWTHORNE, CALIF.
Development of the F-20 nose radome
[AD-P004374] N85-21468
NORTHWESTERN UNIV., EVANSTON, ILL.
Solid electrolytes: Mechanisms for achieving optimal conductivity
[AD-A150116] N85-21296
Properties of supported metal catalysts
[DE85-003927] N85-21303
NUKEM G.M.B.H., HANAU (WEST GERMANY).
Testing and optimization of the production technology of large-surface Cu2S/CdS solar generators N85-21793

O

OAK RIDGE NATIONAL LAB., TENN.
Steel castings by the electroslag casting technique
[DE85-003812] N85-21409
Basic studies of gases for fast switches
[AD-A149828] N85-21514
Program plan for research and development of dielectric materials for electric power systems
[DE85-001327] N85-21520
The 60 GHz gyrotron development program
[DE85-000599] N85-21522
Review of computer mapping and display techniques applicable to regional analysis
[DE85-003545] N85-21764
Latent heat storage technology and application workshop. Summary report: Session 6
[DE85-001097] N85-21806
Response of unmanaged forests to CO2-induced climate change: Available information, initial tests and data requirements
[DOE/NSB-0053] N85-21817
Combined effects of atmospheric deposition, internal acid production, and harvesting on nutrient gains and losses from forest ecosystems
[DE85-002325] N85-21821
Chemical characterization and toxicologic evaluation of airborne mixtures. Inhalation toxicology of diesel fuel obscurant aerosol in Sprague-Dawley rats. Phase 3. Subchronic exposures
[AD-A150100] N85-21966
Bibliography of atomic and molecular processes, 1983
[DE85-000662] N85-22121
Vacancy-rearrangement theory in the first Magnus approximation
[DE85-004435] N85-22123
Shallow land burial technology: Humid
[DE85-004432] N85-22136
Electrostatic confinement in a bumpy torus
[DE85-003794] N85-22164
Plasma performance of TFCX and jet with sawtoothing
[DE85-003335] N85-22168
Enhanced diffusion from interstitial trapping during solid-phase-epitaxial growth of silicon alloys
[DE85-001285] N85-22193
OAK RIDGE Y-12 PLANT, TENN.
Performance of Chromel versus Alumel and Nicrosil versus Nisil thermocouple assemblies in vacuum and argon between 1000 deg C and 1200 deg C
[DE85-000810] N85-21624
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Infrared material optical damage by rain
[AD-P004372] N85-21466
Symmetric primal-dual variational formulations of coupled dynamic systems: Three-dimensional elasticity, shells, fluid-structure interaction
[ONERA-1983-91] N85-21684
OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
The EEC's information technology program: An update
[AD-A150022] N85-22258
OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, D.C.
Technology transfer to the Middle East
[PB85-127744] N85-22264
OHIO STATE UNIV., COLUMBUS.
Engineering calculations for communications satellite systems planning
[NASA-CR-175552] N85-21233
Temperature responses of composite panels
[AD-A150053] N85-21277
Stress corrosion cracking and oxidation characteristics of boride-strengthened microcrystalline iron and nickel based alloys
[AD-A149805] N85-21328
The effects of atmospheric water vapor on infrared propagation
[AD-A150030] N85-22150
OKLAHOMA STATE UNIV., STILLWATER.
Investigation of flowfields found in typical combustor geometries
[NASA-CR-3869] N85-21167
Research on microemulsions for storage and conversion of solar energy
[DE85-000181] N85-21807
OKLAHOMA UNIV., NORMAN.
Vapor pressure studies of the solubilization of hydrocarbons by surfactant micelles
[DE85-004319] N85-21306
Theoretical study of near-threshold electron-molecule scattering
[DE85-004530] N85-22126
OLD DOMINION UNIV., NORFOLK, VA.
Response time correlations for platinum resistance thermometers in flowing fluids
[NASA-CR-172523] N85-21606
OREGON STATE UNIV., CORVALLIS.
Carbonate chemistry of the Weddell Sea
[DOE/EV-110611/4] N85-21916
OREGON UNIV., EUGENE.
Study of the potential usefulness of superfine holographic x-ray gratings in AXAF and astrophysics in general N85-22215
Analyses via automated mass spectrometry (MS/DS) N85-22227
OSSERVATORIO ASTRONOMICO, TURIN (ITALY).
Formation of optical-line emitting regions in the jets of SS433 N85-22318
OXFORD UNIV. (ENGLAND).
Cosmology, galactic astronomy and elementary particle physics N85-22289

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Examination of the feasibility for demonstration and use of radioluminescent lights for Alaskan remote runway lighting
[DE85-002503] N85-21185
Leak detectors for organic Rankine cycle power plants: On-line and manual methods
[DE85-002792] N85-21617
Microprocessor-controlled rotating shadowband radiometer
[DE85-003633] N85-21630
Steam generator tube vibration tests
[DE85-003599] N85-21712

OSCAR experiment high-density network data report
[DE85-004907] N85-21826
Analysis of the NASA/MSFC Airborne Doppler Lidar results from San Gorgonio Pass, California
[NASA-CR-171355] N85-21873
Non-precipitating cumulus cloud study
[DE85-002952] N85-21902

PACIFICA-SIERRA RESEARCH CORP., LOS ANGELES, CALIF.
Calculation of ionospheric profiles by inverting VLF/LF reflection data. 2. Anisotropic propagation
[AD-A150105] N85-21859

PARKE MATHEMATICAL LABS., INC., CARLISLE, MASS.
Topics in optical materials and device research, 3. Volume 2
[AD-A149727] N85-21996
Topics in optical materials and device research, 3: Volume 1
[AD-A149726] N85-22145

PATTERN ANALYSIS AND RECOGNITION CORP., MCLEAN, VA.
Technical support for creating an artificial intelligence system for feature extraction and experimental design
[NASA-CR-175286] N85-22044

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Mass analysis of neutral particles and ions released during electrical breakdowns on spacecraft surfaces
[NASA-CR-175585] N85-21250
Re-design of ARL/HLF (Heated Laminar Flow) body nose region
[AD-A150063] N85-21585
Purification and cultivation of human pituitary growth hormone secreting cells
[NASA-CR-171846] N85-21923

PENNSYLVANIA UNIV., PHILADELPHIA.
Research in image understanding as applied to 3-D tomographic imaging with near optical resolution
[AD-A150098] N85-21483
Polymeric electrolytes for ambient temperature lithium batteries
[DE85-001032] N85-21518
Very-high level concurrent programming
[AD-A150009] N85-22026

PHYSICS LAB. RVO-TNO, THE HAGUE (NETHERLANDS).
The influence on IR emission of engine parameters for an afterburn case. A sensitivity study on NATO infrared air target model (NIRATAM) version: 0.0
[AD-B089311L] N85-21171

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT, BRUNSWICK (WEST GERMANY).
Investigation of the optical properties of solar elements N85-21786

PHYTORESOURCE RESEARCH, INC., COLLEGE STATION, TEX.
Modular plant culture systems for life support functions
[NASA-CR-171853] N85-21924

PINNACLE RESEARCH INST., CUPERTINO, CALIF.
Research on separators for alkaline zinc batteries
[DE85-003082] N85-21523

PITTSBURGH UNIV., PA.
On the limiting empirical distribution function of the eigenvalues of a multivariate F matrix
[AD-A149818] N85-22065

POLISH ACADEMY OF SCIENCES, WARSAW.
Nucleation of phase transitions in the vicinity of phase boundary. Part 1: Comparison of various idolated mechanisms. Part 2: Coupled cluster growth processes
[N-0208-5658] N85-22174
Theory of oriented nucleation with asymmetric single elements. 2: Effects of rotational diffusion
[IFTR-32/1984] N85-22179

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
3-D inelastic analysis methods for hot section components (base program)
[NASA-CR-174700] N85-21686

PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL, WASHINGTON, D.C.
President's private sector survey on cost control, report on research and development
[PB84-173269] N85-22253

PRINCETON UNIV., N. J.
Moving nonlocal crack: Anti-plane shear case
[AD-A149996] N85-21709
General saddlepoint approximations with applications to l-statistics
[AD-A150073] N85-22086

PRINS MAURITS LAB. TNO, RIJSWIJK (NETHERLANDS).
Isolation, concentration and subsequent analysis by capillary gas chromatography of trace amounts of organophosphorus compounds from aqueous samples
[AD-B089301L] N85-21308

PURDUE UNIV., LAFAYETTE, IND.
Monolithic thin film SAW (Surface Acoustic Wave) structures
[AD-A149782] N85-21511
Evaluation of the radiometric quality of the TM data using clustering, linear transformations and multispectral distance measures N85-21731
Spatial resolution estimation of LANDSAT-4 Thematic Mapper data N85-21741
A statistical approach to vendor selection
[AD-A149781] N85-22249

R

RADIAN CORP., AUSTIN, TEX.
Feasibility of producing commodities and electricity for space shuttle operations at Vandenberg Air Force Base
[RAD-84-203-001-80-21] N85-21230

RADIATION MONITORING DEVICES, INC., WATERTOWN, MASS.
Low cost, sprayed CuInSe2 solar cell research
[DE85-003467] N85-21799

RADIO CORP. OF AMERICA, PRINCETON, N. J.
Television camera video level control system
[NASA-CASE-MSC-18578-1] N85-21427

RAI RESEARCH CORP., LONG ISLAND CITY, N. Y.
Research on separators for alkaline zinc batteries
[DE85-003062] N85-21523

RAND CORP., SANTA MONICA, CALIF.
Transmission and orbital constraints in space-related programs: Briefing summary N85-21216
Base communications issues for the 1980s
[AD-A149764] N85-21474
The portable LISP translation tool
[AD-A149765] N85-22023

RAYTHEON CO., BEDFORD, MASS.
Generalized radome BSE (radome boresight error) characterization using superposition techniques
[AD-P004354] N85-21448
Hot radome boresight error measurements
[AD-P004364] N85-21458

RAYTHEON CO., GOLETA, CALIF.
3-D Dome/Rotman lens antenna breadboard demonstration
[AD-A149809] N85-21475

RCA ADVANCED TECHNOLOGY LABS., CAMDEN, N. J.
Monolithic short wave infrared (SWIR) detector array
[NASA-CR-175284] N85-21759

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Composite structural materials
[NASA-CR-175515] N85-21268
Stress corrosion cracking behavior of tungsten heavy alloys
[AD-A149843] N85-21329

RESEARCH AND DATA SYSTEMS, INC., LANHAM, MD.
An analysis of the high frequency vibrations in early Thematic Mapper scenes N85-21742

RESEARCH INST. OF NATIONAL DEFENCE, LINKOEPING (SWEDEN).
Electromagnetic pulse (EMP) injection on cable entries, type ERA; EMP memo no. 10
[FOA-E-30003-A3] N85-21484
Distributed Gunn effect devices; a numerical analysis of microstrip circuits on thin active GaAs substrates
[FOA-C-30383-E] N85-21527

RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
Biological effects of blast and impact waves
[FOA-C-52006-H4-D7] N85-21968
The accuracy in calculations of intervisibility with digital terrain models
[FOA-C-20557-D8(E1)] N85-21983

RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N.C.
Stability of organic audit materials and results of source test analysis audits
[PB85-116184] N85-21832

RESOURCE MANAGEMENT ASSOCIATES, INC., LAFAYETTE, CALIF.
Development of a Global 3-D magnetohydrodynamic computational model for solar wind-comstary and planetary studies
[NASA-CR-175490] N85-22331

RHEOLOGY RESEARCH, GAITHERSBURG, MD.
Rheology of dissemination
[AD-A150006] N85-21373

RICE UNIV., HOUSTON, TEX.
A replication and extension of the inducement of the availability heuristic
[AD-A149755] N85-22083
Task influences in the analytic-intuitive approach to decision making
[AD-A149870] N85-22250

RINGSDORFF-WERKE G.M.B.H., BONN (WEST GERMANY).
Large-size fine-granular graphite for solar techniques N85-21780

ROCHESTER INST. OF TECH., N. Y.
Evaluation of the radiometric integrity of LANDSAT 4 Thematic Mapper band 6 data N85-21726
LANDSAT 4 band 6 data evaluation
[E85-10093] N85-21755

ROCHESTER UNIV., N. Y.
Fracture toughness of materials
[DE85-004306] N85-21713

ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Speed and accuracy in automated manufacture
[DE85-003913] N85-21410

ROCKWELL INTERNATIONAL CORP., THOUSAND OAKS, CALIF.
Millimeter wave dielectric property measurement of gyrotron window materials
[DE85-004430] N85-21304

ROYAL AIR FORCE, LONDON (ENGLAND).
Introduction: The clinical and biomedical evaluation for trauma and fatalities associated with aircrew ejection and crash N85-21970
A review of fatality, impairment of consciousness and head and neck injury on Royal Air Force ejections 1968-1981 N85-21975

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
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[AD-A149787] N85-22257

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
Space research and the new approach to the mechanics of fluid media in cosmos N85-22271
Plasma processes in Herbig-Haro objects N85-22301

ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
On the relationship between maximum surface temperature and various parameters; with reference to objective forecasting
[KNMI-TR-58] N85-21905

ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
The evolution of methods of air traffic control
[AD-A149606] N85-21137

RUHR UNIV., BOCHUM (WEST GERMANY).
Some constraints on magnetic fields in galactic spiral arms N85-22300

S

SALFORD UNIV. (ENGLAND).
Microstructural and electronic characteristics of metallic spin glasses
[AD-A149959] N85-21371

SAN JUAN COLL., FARMINGTON, N. MEX.
The modelling of latitudinal gradients in the solar wind in the outer solar system N85-22231

SANDIA LABS., ALBUQUERQUE, N. MEX.
Tailored airfoils for vertical axis wind turbines
[DE85-004628] N85-21128
Wavecode constitutive models: Nonhomogeneous mixtures
[DE85-000836] N85-21278
Hydrogen flame acceleration and transition to detonation
[DE85-000611] N85-21299
Comparison of shock-induced displacements with displacements produced by a centrifuge acceleration
[DE85-000487] N85-21618
Performance assessment of Class 1E pressure transmitters subjected to environmental stresses
[DE85-001623] N85-21626
Some solar dish/heat engine design considerations
[DE85-003479] N85-21802
Shallow magma targets in the western US
[DE85-003274] N85-21803
Analysis of slope stability, Wilmington to Lindenkohl Canyons, US mid-Atlantic margin
[DE84-012278] N85-21921
Evaluation of implantation-disordering of (InGa)As/GaAs strained-layer superlattices
[DE85-003533] N85-22200

SANDIA LABS., LIVERMORE, CALIF.
Solid particle receiver experiments: Velocity measurements
[DE85-000257] N85-21623

SATCOM INTERNATIONAL, PARIS (FRANCE).
Multimission advanced configurations study
[MATRA-DM.51/CC/FL/0151.83] N85-21237

SCHLUMBERGER-DOLL RESEARCH, RIDGEFIELD, CONN.
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197
SCHMITT (RAINER), GLASHUTTEN (WEST GERMANY).
Investigations of micro-turbulence in the bottom of the boundary layer
[AD-A149623] N85-21897
SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Second generation USAFSAM (United States Air Force School of Aerospace Medicine) microprocessor audiometer
[AD-A149938] N85-21963
SCIENCE APPLICATIONS, INC., LA JOLLA, CALIF.
Improvement of VHF(MB) model
[AD-A150087] N85-21480
SCIENCE APPLICATIONS, INC., MCLEAN, VA.
Intensification of tropical instabilities
[AD-A149985] N85-21899
Twenty-five sound propagation tests on the continental shelf between Long Island, New York and Cape Canaveral, Florida
[AD-A149869] N85-22111
Technical support for microwave experiments on the eye lens
[AD-A149702] N85-22144
SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CONN.
Solution of the three-dimensional Navier-Stokes equations for a steady laminar horseshoe vortex flow
[AD-A149851] N85-21582
Semiconductor materials for high frequency solid state sources
[AD-A150020] N85-22186
SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Microplankton species assemblages at the Scripps Pier from March to November 1983 during the 1982-1984 El Nino event
[NASA-CR-175553] N85-21926
SCUOLA NORMALE SUPERIORE, PISA (ITALY).
Dynamics of elliptical galaxies and the r sup 1/4 luminosity law N85-22282
On the morphology of spiral modes N85-22283
SIEMENS A.G., MUNICH (WEST GERMANY).
Flat-plate silicon for solar cells N85-21776
Carbothermic production of silicon solar cells using high-purity starting materials N85-21777
Photovoltaic solar components N85-21782
Pin solar cells made of amorphous silicon N85-21787
SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Biological processes in the water column of the South Atlantic Bight. Volume 1: Published manuscripts
[DE85-004610] N85-21929
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Development of high resolution imaging detectors for X-ray astronomy
[NASA-CR-175505] N85-22266
SOUTH CAROLINA UNIV., COLUMBIA.
An asymptotically optimal subclass of BTIB designs for comparisons with a control
[AD-A149819] N85-22066
SOUTH DAKOTA STATE UNIV., BROOKINGS.
Considerations for upgrading modifications to the Marshall Space Flight Center's X-ray calibration facility N85-22226
SOUTHERN METHODIST UNIV., DALLAS, TEX.
Spread spectrum mobile radio communications
[AD-A149938] N85-21477
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
A study of intumescent reaction mechanisms
[AD-A149805] N85-21365
Thin film strain transducer
[NASA-CASE-WLP-10055-2] N85-21598
SOUTHWESTERN UNIV., GEORGETOWN, TEX.
Preliminary design of an Earth-based debris detection system using current technology and existing installations N85-21199
SPACE TELESCOPE SCIENCE INST., HUNTSVILLE, ALA.
IRAS observations of Seyfert galaxies
[NASA-CR-175557] N85-22267
SPACETECH, INC., STATE COLLEGE, PA.
A remotely controlled orbiting retriever N85-21212
SPECTRON DEVELOPMENT LABS., INC., COSTA MESA, CALIF.
Research study of droplet sizing technology leading to the development of an advanced droplet sizing system
[NASA-CR-174839] N85-21604
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Two-dimensional measurements of OH concentration and temperature in reactive flows
[AD-A149849] N85-21292
Adsorption thermodynamics and surface transport of metal catalyst poisons
[DE85-003750] N85-21301
Oxidation and gum formation in jet fuels
[AD-A149934] N85-21401
Observational study of transport in the free troposphere
[PB85-144145] N85-21845
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Universal file processing program for field programmable integrated circuits
[DE85-004384] N85-21526
Single-cavity SLED device
[DE85-002587] N85-22117
Review of polarized proton beam techniques and a report on the workshop on polarized beams
[DE85-004390] N85-22127
STANFORD UNIV., CALIF.
An experimental investigation of an underexpanded rectangular jet ejector
[AD-A149656] N85-21170
The ULF/ELF/VLF electromagnetic fields generated in a sea of finite depth by elevated dipole sources
[AD-A149638] N85-21470
Theoretical and empirical studies of the basic structure of turbulent shear flows, including separated flows and effects of wall curvature
[AD-A149657] N85-21580
On maximizing the expected lifetime of replaceable systems
[AD-A150003] N85-21680
User's guide for NPSOL (Version 2.1): A FORTRAN package for quadratic programming
[AD-A150078] N85-22028
Tests of fit based on normalized spacings
[AD-A149749] N85-22062
Recursive moment formulas for regenerative simulation
[AD-A150112] N85-22070
Direct secant updates of sparse matrix factors
[DE85-004008] N85-22073
A diffusion process and its application to detecting a change in the drift of Brownian motion
[AD-A150096] N85-22100
State-selected ion-molecule reaction dynamics
[AD-A150068] N85-22115
Radio scintillations observed during atmospheric occultations of Voyager: Internal gravity waves at Titan and magnetic field orientations at Jupiter and Saturn
[NASA-CR-175554] N85-22327
Thermal stability of static coronal loops: Part 1: Effects of boundary conditions
[NASA-CR-175495] N85-22330
STATE UNIV. OF NEW YORK, BUFFALO.
Electrochemistry and electrochemical methodology in molten salts
[AD-A149613] N85-21284
Investigation of the initial events in biofouling
[AD-A149995] N85-21927
High pressure environmental conditioning systems and chamber rehabilitation
[AD-A150039] N85-21964
STATE UNIV. OF NEW YORK, STONY BROOK.
Chemisorption theory: Adsorption on copper-nickel alloys and titanium surface embrittlement
[DE85-001815] N85-21334
Axiomatic characterizations of continuum structure functions
[AD-A149817] N85-21706
STUTTGART UNIV. (WEST GERMANY).
Plasmachemical evaporation and doping of amorphous silicon N85-21790
Development of high-efficiency economic systems for photovoltaics N85-21795
SUNPOWER, INC., ATHENS, OHIO.
Gas-fired duplex free-piston Stirling refrigerator N85-21413
SUSSEX UNIV., BRIGHTON (ENGLAND).
The axisymmetric pulsar magnetosphere N85-22279
SYDNEY UNIV. (AUSTRALIA).
Behavior of buried flexible cylinders under the influence of nonuniform hoop compression
[PB85-116523] N85-21718
SYRACUSE UNIV., N. Y.
A moment solution for an arbitrary configuration of partly shielded wires above a ground plane
[AD-A149762] N85-21473
SYSTEMS AND APPLIED SCIENCES CORP., HAMPTON, VA.
Earth radiation budget experiment software development
[NASA-CR-172567] N85-22002
SYSTEMS AND APPLIED SCIENCES CORP., HYATTSVILLE, MD.
The use of linear feature detection to investigate Thematic Mapper data performance and processing N85-21740
SYSTEMS APPLICATIONS, INC., SAN RAFAEL, CALIF.
Continued research in mesoscale air pollution simulation modeling. Volume 6. Further studies in the modeling of microscale phenomena
[PB85-137370] N85-21844
SYSTEMS CONTROL TECHNOLOGY, INC., DAYTON, OHIO.
Integrated control system engineering support
[AD-A149742] N85-21177
SYSTEMS CONTROL TECHNOLOGY, INC., WEST PALM BEACH, FLA.
Evaluating wind flow around buildings on heliport placement
[FAA-PM-84-25] N85-21881
SYSTEMS RESEARCH LABS., INC., DAYTON, OHIO.
The effect of jamming/deception on decision making
[AD-A149740] N85-21472

T

TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO.
Reliability analysis of automatic systems
[VTT-301] N85-21682
TECHNION - ISRAEL INST. OF TECH., HAIFA.
The effect of an elastic foundation and of dissipative forces on the stability of fluid conveying pipes
[TAE-563] N85-21688
TECHNISCHE HOCHSCHULE, DARMSTADT (WEST GERMANY).
Determination of the drag of free flying particles in supersonic flow with a pulsed laser N85-21129
TECHNISCHE UNIV., BERLIN (WEST GERMANY).
Yield joint condition for three-dimensional I-beams
[ILR-MITT-137] N85-21716
TECHNISCHE UNIV., CLAUSTHAL-ZELLERFELD (WEST GERMANY).
Theoretical and experimental investigations of dust loaded flow fields in industrial halls
[BMFT-FB-HA-84-044] N85-21411
TECHNISCHE UNIV., MUNICH (WEST GERMANY).
A survey of the project CIP: Computer aided, intuition-guided programming. Wide spectrum language and program transformations
[TUM-I8406] N85-22000
The performance of a type-insensitive Runge-Kutta code on a personal computer
[TUM-I8410] N85-22048
TELEDYNE GEOTECHNICAL, GARLAND, TEX.
Seismic observation of infrasonic signals
[AD-A149574] N85-21853
TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE.
Silicon carbide-silicon nitride fibers: Preparation and characterization of polycarbosilazane precursors N85-22214
Debris impact on Earth-orbiting spacecraft N85-22234
Solid Rocket Motor Case (SRMC) dynamic sensitivity to changes in composite properties N85-22238
Electrical performance of semiconductor devices at cryogenic temperatures N85-22239
Evaluation of PHOENICS as a design analysis tool for SSME N85-22240
TENNESSEE UNIV., KNOXVILLE.
An investigation of space shuttle main engine shutdown chugging instability N85-22221
TERRA TEK, INC., SALT LAKE CITY, UTAH.
Evaluation of subsurface fracture geometry using fluid pressure response to solid earth tidal strain
[DE85-003294] N85-21864
TEXAS A&M UNIV., COLLEGE STATION.
Propeller propulsion system integration: State of technology survey
[NASA-CR-3882] N85-21119
Process development for commercial production of natural rubber from Guayule
[PB85-124956] N85-21388
TEXAS INSTRUMENTS, INC., DALLAS.
Broadband thermoplastic radomes
[AD-P004369] N85-21463
TEXAS UNIV., AUSTIN.
The long term behaviour of Earth orbits and the implications for debris control N85-21213
The study of certain aspects of probability with applications in communications theory
[AD-A149820] N85-21476
A Gypsy-to-Ada program compiler
[TR-39] N85-22005

Towards the generation of efficient code from verified programs
[TR-40] N85-22017

TEXAS UNIV., DALLAS.
Study of outgassing and decomposition of space shuttle heat protection tiles, fillers and adhesive
[NASA-CR-175565] N85-21242

THYSSEN STAHL A.G., DUISBURG (WEST GERMANY).
High strength steel sheet with dual phase structure
[BMFT-FB-T-84-219] N85-21342

TOKYO UNIV. (JAPAN).
Coexistence of antiferromagnetism and spin-glass ordering in the Ising system FeO 55MgO 45Cl2
[DE85-004164] N85-22197
Electron-positron pairs in a mildly relativistic plasma in active galactic nuclei N85-22297

TORONTO UNIV. (ONTARIO).
Pseudo-stationary oblique-shock-wave reflections in a polyatomic gas, sulfur hexafluoride
[UTIAS-TN-253] N85-21577
Some individual differences in human response to infrasound
[UTIAS-282] N85-21960

TOYAMA UNIV. (JAPAN).
Forced recognition by nonlinear MHD waves and sequential triggering of solar flares N85-22291
Explosive transverse electric field and particle acceleration during magnetic collapse N85-22292

TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
General aviation activity and avionics survey
[AD-A149572] N85-21103

TRC ENVIRONMENTAL CONSULTANTS, INC., EAST HARTFORD, CONN.
Evaluation of complex terrain air quality simulation models
[PB85-119485] N85-21835

TURIN UNIV. (ITALY).
Mechanical energy release by protostars to molecular clouds N85-22302
Determination of physical parameters of jets in radio galaxies N85-22304
Magnetohydrodynamic (MHD) turbulence in radio galaxies N85-22305
Jets in galaxies N85-22309
Equilibrium model of thin magnetic flux tubes N85-22310

TUSKEGEE INST., ALA.
Arc-driven rail gun research
[NASA CR-174816] N85-21662

U

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL (ENGLAND).
Transverse microstructure of an oxide scale formed on a 20 % Cr/25 % Ni niobium stabilized stainless steel
[AERE-R-11034] N85-21315
The application of expert systems to corrosion problems
[AERE-M-3445] N85-21316
The role of dislocations in ultrasonic attenuation
[AERE-R-11384] N85-21317
Defect characterisation and monitoring by acoustic emission
[AERE-R-11409] N85-21683
Characterisation of fatigue crack extension by quantitative acoustic emission
[AERE-R-11289] N85-21721
The measurement of residual stresses using ultrasonics
[AERE-R-11415] N85-21722
A remote source system for measuring relative positron annihilation line widths in individual slab cylindrical samples
[AERE-R-10549] N85-22173
Texture independent determination of residual stress in polycrystalline aggregates using Rayleigh waves
[AERE-R11483] N85-22203

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Investigation of plasma processes in electronic transition lasers
[AD-A149682] N85-21506

UNIVERSIDAD POLITECNICA DE MADRID (SPAIN).
Opacity determinations for Inertial Confinement Fusion (ICF) materials using an average atom model N85-22295

UNIVERSITY COLL. OF WALES, ABERYSTWYTH.
The behaviour of detonation waves in single phase heterogeneous systems
[AD-A149825] N85-21581

UNIVERSITY OF CENTRAL FLORIDA, ORLANDO.
NASA: Model development for human factors interfacing
[NASA-CR-175584] N85-21985

UTAH UNIV., SALT LAKE CITY.
Building a functional, integrated GIS/remote sensing resource analysis and planning system
[E85-10092] N85-21754
Structure and forcing of teleconnection patterns occurring in general circulation model simulations
[DE85-002434] N85-21862
International Conference on Defects in Insulating Crystals
[AD-A149611] N85-22180

V

VACUUMSCHMELZE G.M.B.H., HANAU (WEST GERMANY).
Silicon band spraying technique for solar cells N85-21778

VARIAN ASSOCIATES, PALO ALTO, CALIF.
The 60 GHz gyrotron development program
[DE85-000599] N85-21522

VDEH-INSTITUT FUER ANGEWANDTE FORSCHUNG G.M.B.H., DUESSELDORF (WEST GERMANY).
Nondestructive testing of stainless steel to improve quality and output efficiency of the processing of ingot and continuous casting
[BMFT-FB-T-84-240] N85-21345

VEREINIGTE ALUMINIUM-WERKE A.G., BONN (WEST GERMANY).
Carbon filter plates for aluminum filtration at casting
[BMFT-FB-T-84-242] N85-21343

VILLANOVA UNIV., PA.
Aerostructure nondestructive evaluation by thermal field detection. Phase 2: Technique refinement and quantitative determination of flaw detection capabilities
[AD-A149622] N85-21155

VINETA, INC., FALLS CHURCH, VA.
Closed cycle versus open cycle gas turbines. A review of A.D. Little's ICOP report, vol. 3
[DE85-000564] N85-21671

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Optimal symmetric flight studies
[NASA-CR-172508] N85-21176
Accelerated viscoelastic characterization of T300-5208 graphite-epoxy laminates
[NASA-CR-3871] N85-21271
Nonlinear analysis of layered composite plates and shells
[PB85-127181] N85-21719
Geometrically nonlinear analysis of laminated elastic structures
[NASA-CR-175609] N85-21720

W

WASHINGTON STATE UNIV., PULLMAN.
Magnetically-induced luminescence of (Ir(2=phos)(2)C10(4)
[AD-A149659] N85-21286

WASHINGTON UNIV., SEATTLE.
Passive microwave remote sensing for sea ice research
[NASA-CR-175570] N85-21758
Studies of the mechanisms and rates with which nitrogen species are incorporated into cloud water and precipitation
[PB85-144350] N85-21914
Circulation and internal waves in a cold Gulf Stream waves
[AD-A149704] N85-21918
Ordinary and proper location M-estimates for ARMA models, revised
[AD-A149705] N85-22061
A review of some aspects of robust inference for time series
[AD-A149706] N85-22082
Surface forward scattering and reflection
[AD-A150115] N85-22112

WASHINGTON UNIV., ST. LOUIS, MO.
Quantitative non-destructive evaluation of damage in composite materials using transmitted and reflected ultrasound
[NASA-CR-175550] N85-21269

WAYNE STATE UNIV., DETROIT, MICH.
Synthesis, static and reactive characterization of supported organometallics
[DE85-004285] N85-21340

WEBB, MURRAY AND ASSOCIATES, INC., HOUSTON, TEX.
Test results from a comparative evaluation of a condensation nuclei fire detector
[NASA-CR-3874] N85-21675

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Factors affecting SOS (Silicon-On-Sapphire) yield and reliability
[AD-A150004] N85-21515
Thin film technology of high-critical-temperature superconducting electronics
[AD-A150010] N85-22185

WISCONSIN UNIV., MADISON.
Space Shuttle interactive meteorological data system study
[NASA-CR-171418] N85-21876
Local behavior of solutions of an elliptic-parabolic equation
[AD-A149624] N85-22057
A method of calculating periodic solutions of second order dynamical systems
[AD-A149634] N85-22058
Approximation order from certain spaces of smooth bivariate splines on a 3-direction mesh
[AD-A149633] N85-22092
An airborne infrared thermal scanning system for easy use on Navy P-3 aircraft
[AD-A149690] N85-22143
Pressure-gradient-driven Tokamak resistive MHD instability in the banana-plateau collisionality regime
[DE85-004568] N85-22171
A survey of Mg II h and k emission in near-solar type stars
[NASA-CR-175572] N85-22269

WRIGHT STATE UNIV., DAYTON, OHIO.
Modal control of structural systems
[AD-A149734] N85-21235

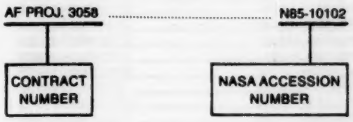
WYOMING UNIV., LARAMIE.
A study of organic chemical reactions in microemulsions
[AD-A150033] N85-21265

Y

YALE UNIV., NEW HAVEN, CONN.
In situ monitoring of electrochemical reactions by surface enhanced Raman scattering
[PB85-149789] N85-21312

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

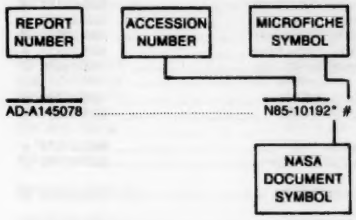
AF PROJ. 2157 ..... N85-21479
AF PROJ. 2301 ..... N85-21516
N85-22116
AF PROJ. 2303 ..... N85-21372
AF PROJ. 2304 ..... N85-22046
AF PROJ. 2305 ..... N85-21483
N85-21659
AF PROJ. 2307 ..... N85-21126
N85-21587
N85-21588
AF PROJ. 2308 ..... N85-21297
AF PROJ. 2401 ..... N85-21277
AF PROJ. 2917 ..... N85-21999
AF PROJ. 3654 ..... N85-21253
AF PROJ. 4600 ..... N85-21478
AF-AFOSR-81-0142 ..... N85-21719
AF-AFOSR-83-0089 ..... N85-22049
AF-AFOSR-0001-84 ..... N85-22099
AF-AFOSR-0005-80 ..... N85-21371
AF-AFOSR-0005-81 ..... N85-21357
AF-AFOSR-0007-81 ..... N85-21264
AF-AFOSR-0030-83 ..... N85-22181
AF-AFOSR-0037-80 ..... N85-22149
AF-AFOSR-0047-81 ..... N85-21476
AF-AFOSR-0098-82 ..... N85-21577
AF-AFOSR-0136-80 ..... N85-21579
AF-AFOSR-0158-84 ..... N85-22066
AF-AFOSR-0165-83 ..... N85-21558
AF-AFOSR-0187-83 ..... N85-21957
AF-AFOSR-0190-81 ..... N85-22059
AF-AFOSR-0237-83 ..... N85-21511
AF-AFOSR-0240-80 ..... N85-21860
AF-AFOSR-0240-81 ..... N85-21483
AF-AFOSR-0243-84 ..... N85-21706
AF-AFOSR-0245-82 ..... N85-21510
N85-22046
AF-AFOSR-0247-81 ..... N85-21581
AF-AFOSR-0286-82 ..... N85-21274
N85-21276
AF-AFOSR-0305-83 ..... N85-21999
AF-AFOSR-0309-82 ..... N85-21477
AF-AFOSR-0318-82 ..... N85-21509
AF-AFOSR-0338-83 ..... N85-21516
ARPA ORDER 3480 ..... N85-22023
ARPA ORDER 3654 ..... N85-21253
A82/KLU/081 ..... N85-21171
CNR-PSN-83-035 ..... N85-22310
DA PROJ. 1L1-61102-AH-43 ..... N85-21707
N85-21706
DA PROJ. 1L1-61102-AH-51 ..... N85-21269
DA PROJ. 1L1-62622-A-552 ..... N85-21584
DA PROJ. 1T1-61102-BH-57 ..... N85-21897
N85-22019
DA PROJ. 4A7-62730-AT-42 ..... N85-21858
DA PROJ. 776-6 ..... N85-21983
DAAA22-81-C-0138 ..... N85-21329
DAAG24-83-K-0058 ..... N85-21357
DAAG29-78-G-0007 ..... N85-21331
DAAG29-80-C-0041 ..... N85-22057
N85-22058
N85-22092
DAAG29-81-C-0007 ..... N85-21586
DAAG29-81-D-0100 ..... N85-21760
DAAG29-81-K-0041 ..... N85-21331
DAAG29-81-K-0084 ..... N85-22150
DAAG29-81-K-0100 ..... N85-21265
DAAG29-81-K-0155 ..... N85-21298
DAAG29-81-K-0158 ..... N85-22028
DAAG29-82-K-0007 ..... N85-21296
DAAG29-82-K-0020 ..... N85-21928
DAAG29-82-K-0155 ..... N85-22084
DAAG29-82-K-0177 ..... N85-21375
DAAG29-82-K-0178 ..... N85-22086
DAAG29-83-C-0005 ..... N85-21898
DAAG29-83-K-0007 ..... N85-21589
DAAG29-83-K-0017 ..... N85-21481
DAAG29-83-K-0061 ..... N85-21293
DAAG29-83-K-0067 ..... N85-21517
DAAG29-84-K-0030 ..... N85-22070
DAAG29-84-K-0161 ..... N85-21401
DAAG29-84-K-0207 ..... N85-22087
DAAG29-84-M-0346 ..... N85-21444
DAAK11-82-K-0004 ..... N85-21584
DAAK11-82-K-0005 ..... N85-21708
DAAK11-82-K-0015 ..... N85-21707
DAAK11-83-C-0040 ..... N85-21373
DAAK70-82-C-0001 ..... N85-21289
DAAK70-85-C-0007 ..... N85-21289
DAHC19-78-C-0001 ..... N85-21978
DAJA45-83-C-0038 ..... N85-21897
DAJA45-84-C-0011 ..... N85-22019
DAMD17-80-C-0057 ..... N85-22144
DARPA ORDER 4346 ..... N85-21853
DARPA PROJ. 3617 ..... N85-21645
DE-AC02-81ER1084 ..... N85-22086
DE-AC01-81CS-40403 ..... N85-21671
DE-AC01-81ER-40007 ..... N85-22130
DE-AC01-84ER-30059 ..... N85-22091
DE-AC02-76CB-00016 ..... N85-22192
DE-AC02-76CH-00016 ..... N85-21300
N85-21335
N85-21819
N85-21822
N85-21823
N85-22124
N85-22154
N85-22191
N85-22194
N85-22197
N85-22198
DE-AC02-76CH-03000 ..... N85-21524
N85-22102
DE-AC02-76CH-03073 ..... N85-22166
DE-AC02-76ER-03077 ..... N85-21589
DE-AC02-76ER-03265 ..... N85-22207
DE-AC02-76ET-53006 ..... N85-22170
DE-AC02-77ER-04254 ..... N85-21303
DE-AC02-79ER-10361 ..... N85-21340
DE-AC02-80ER-53104 ..... N85-22171
DE-AC02-80RA-50153 ..... N85-21503
DE-AC02-81ER-40015 ..... N85-22135
DE-AC02-82ER-13026 ..... N85-21799
DE-AC02-83CH-10093 ..... N85-21377
N85-21378
N85-21714
N85-21770
N85-21771
N85-21800
N85-21805
DE-AC02-83ER-45017 ..... N85-21627
DE-AC02-83ER-45021 ..... N85-21334
DE-AC03-76SF-00098 ..... N85-21305
N85-21516
N85-21519
N85-21523
N85-21525
N85-21590
N85-21619
N85-21622
N85-21646
N85-22071
N85-22116
N85-22167
N85-22190
N85-22259
DE-AC03-76SF-00515 ..... N85-21526
N85-22117
N85-22127
DE-AC03-81CS-30569 ..... N85-21796
DE-AC03-83SF-11693 ..... N85-21772
DE-AC03-84OR-21400 ..... N85-22171
DE-AC03-84SF-12197 ..... N85-21591
DE-AC04-78DP-00053 ..... N85-21336
N85-22205
DE-AC04-78DP-00656 ..... N85-22101
DE-AC04-78DP-00789 ..... N85-21128
N85-21276
N85-21299
N85-21336
N85-21618
N85-21626
N85-21802
N85-21803
N85-21921
N85-22200
DE-AC04-78DP-03533 ..... N85-21410
DE-AC04-78DR-00789 ..... N85-21623
N85-21808
N85-21827
DE-AC05-76OR-00033 ..... N85-22133
DE-AC05-84CE-21400 ..... N85-21522
DE-AC05-84CR-21400 ..... N85-21806
DE-AC05-84OR-21400 ..... N85-21304
N85-21409
N85-21520
N85-21624
N85-21821
N85-22121
N85-22123
N85-22136
N85-22164
DE-AC05-84OS-21400 ..... N85-21624
DE-AC05-87CR-21400 ..... N85-21764
DE-AC06-76FF-02170 ..... N85-21339
DE-AC06-76RL-01830 ..... N85-21185
N85-21617
N85-21630
N85-21712
N85-21824
N85-21826
N85-21902
DE-AC07-76ID-01570 ..... N85-21127
N85-21670
N85-21811
N85-22114
DE-AC09-76SR-00001 ..... N85-21592
N85-21825
DE-AC12-76SN-00052 ..... N85-21337
DE-AC21-81MC-14521 ..... N85-22031
N85-22032
DE-AI01-76PR-08010 ..... N85-21809
N85-21810
N85-21813
N85-21815
DE-AI05-83ER40117 ..... N85-21642
N85-22163
DE-AI08-79DP-40092 ..... N85-22120
DE-AM03-76SF-00326 ..... N85-22028
DE-AS05-79ER-10419 ..... N85-22137
DE-AS05-79ER-10513 ..... N85-22126
DE-AS05-81ER-40008 ..... N85-22119
DE-AS09-76EV-00936 ..... N85-21929
DE-AT01-80RA-50241 ..... N85-21804
DE-AT03-76ER-72018 ..... N85-22029
N85-22073
DE-AT03-77ER-71126 ..... N85-21301
DE-AT03-84ER-51044 ..... N85-21820
N85-22165
DE-AT06-81EV-10611 ..... N85-21916
DE-AT19-81BC-10476 ..... N85-21308
DE-FG02-80ER-10794 ..... N85-21807
DE-FG02-84ER-45051 ..... N85-21713
DE-FG02-84ER-45055 ..... N85-22199
DE-FG02-84ER-45073 ..... N85-21370
DE-FG02-84ER-45118 ..... N85-22201
DE-FG05-80ET-53088 ..... N85-22291
DE-FG22-83PC-60783 ..... N85-21302

DE-SC06-83RL-10312 ..... N85-21185
DEFA01-80-C-10080 ..... N85-21861
DNA-001-83-C-0266 ..... N85-21577
DOE-42-0124-60-2 ..... N85-21514
DOT-FA78WAI-863 ..... N85-21872
DT-FA01-83-Y-10554 ..... N85-21139
DTFA01-81-C-10057 ..... N85-21180
N85-21181
N85-21182
DTFA01-81-C10057 ..... N85-21184
DTFA01-891-C10057 ..... N85-21183
EDA-RED-785-G-82-2 ..... N85-21366
EDA-RED-800-G-83-2 ..... N85-21369
EDA-99-7-13594 ..... N85-21386
EDA-99-7-13808 ..... N85-21389
EPA-68-02-2216 ..... N85-21844
EPA-68-02-3171 ..... N85-21230
EPA-68-02-3174 ..... N85-21834
EPA-68-02-3514 ..... N85-21835
EPA-68-02-3767 ..... N85-21832
EPA-68-02-3791 ..... N85-21845
EPA-68-03-2494 ..... N85-21833
ESA-5279/82/F-RD(SC) N85-21237
F21-243 ..... N85-22024
F41-460 ..... N85-21155
F61-541 ..... N85-21408
F04701-83-C-0084 ..... N85-21236
N85-21505
F19628-80-C-0146 ..... N85-21478
F19628-81-C-0013 ..... N85-21508
F19628-81-C-0052 ..... N85-21996
N85-22145
F19628-81-C-0088 ..... N85-21859
F19628-83-K-0034 ..... N85-22151
F19628-85-C-0002 ..... N85-21136
F30602-81-C-0025 ..... N85-21479
F30602-81-C-0146 ..... N85-21515
F30602-81-C-0149 ..... N85-21995
F30602-82-C-0053 ..... N85-21253
F30602-83-C-0019 ..... N85-21507
F33615-79-C-3614 ..... N85-21177
F33615-79-C-5100 ..... N85-21367
F33615-81-C-0012 ..... N85-21159
F33615-81-K-2033 ..... N85-21292
F33615-82-C-5039 ..... N85-21275
F33615-83-C-3000 ..... N85-21235
N85-21277
F33615-83-C-5108 ..... N85-21678
F33616-82-C-0511 ..... N85-21472
F42600-81-D-1379 ..... N85-21399
F49620-79-C-0010 ..... N85-21580
F49620-79-C-0189 ..... N85-21170
F49620-80-C-0074 ..... N85-21616
F49620-81-C-0030 ..... N85-21297
F49620-82-C-0009 ..... N85-21677
N85-22098
F49620-82-C-0018 ..... N85-21474
F49620-82-C-0020 ..... N85-21124
F49620-82-C-0022 ..... N85-21126
F49620-82-C-0025 ..... N85-21123
F49620-82-C-0026 ..... N85-21587
F49620-82-C-0067 ..... N85-22116
F49620-82-K-0001 ..... N85-22065
F49620-82-K-0017 ..... N85-22090
F49620-83-C-0033 ..... N85-22115
F49620-83-C-0062 ..... N85-22064
F49620-83-C-0100 ..... N85-21998
N85-22147
F49620-83-C-0110 ..... N85-21616
F49620-83-C-0136 ..... N85-21853
F49620-83-C-0139 ..... N85-22182
GRI-5014-353-0160 ..... N85-21594
GRI-5082-512-0622 ..... N85-21530
GRI-5083-260-0795 ..... N85-21312
HPR-FCP-45D2-684 ..... N85-21415
JPL-953618 ..... N85-22327
JPL-953733 ..... N85-22274
JPL-954012 ..... N85-22312
JPL-954013 ..... N85-22312
MDA903-82-C-0061 ..... N85-22023
MIPR-FY7653-83-00010 ..... N85-21856
MIPR-W31RPD-33-V062 ..... N85-21856
NA-81AA-D-00094 ..... N85-21922
NAAS-4006 ..... N85-21169
NAGW-79 ..... N85-22310
NAGW-92 ..... N85-22330
NAGW-253 ..... N85-22310
NAGW-266 ..... N85-21753
NAGW-386 ..... N85-22294
N85-22312
NAGW-456 ..... N85-21926
NAGW-601 ..... N85-21847
NAG1-141 ..... N85-21272
NAG1-203 ..... N85-21176
NAG1-214 ..... N85-21119
NAG1-256 ..... N85-21242
NAG1-392 ..... N85-21571
NAG1-457 ..... N85-22004
NAG3-33 ..... N85-21165
N85-21687
NAG3-34 ..... N85-21117
NAG3-60 ..... N85-21166
NAG3-74 ..... N85-21167
NAG3-76 ..... N85-21662
NAG3-147 ..... N85-21162
NAG3-159 ..... N85-21233
NAG3-206 ..... N85-21720
NAG3-223 ..... N85-21685
NAG3-266 ..... N85-21320
NAG3-379 ..... N85-21691
NAG3-475 ..... N85-21438
NAG5-337 ..... N85-22268
NAG5-407 ..... N85-22001
NAG5-605 ..... N85-22266
NAG10-0010 ..... N85-21985
NASA ORDER C-54715-D N85-21607
NASA ORDER S-10757-C N85-21757
NASA ORDER 15519 ..... N85-22333
NASW-3811 ..... N85-21414
NASW-3862 ..... N85-21240
NASW-4004 ..... N85-21406
N85-21611
N85-21660
N85-22209
NASW-4005 ..... N85-22324
NASW-4006 ..... N85-21111
N85-21244
NASW-4011 ..... N85-22331
NAS1-15810 ..... N85-21991
NAS1-15884 ..... N85-21877
NAS1-16571 ..... N85-22002
NAS1-17070 ..... N85-21575
N85-21990
N85-21991
N85-22003
N85-22004
N85-22049
N85-22050
N85-22051
NAS1-17099 ..... N85-21606
NAS1-17130 ..... N85-21991
NAS1-17411 ..... N85-21173
NAS3-23056 ..... N85-21163
NAS3-23538 ..... N85-21604
NAS3-23697 ..... N85-21686
NAS5-16538 ..... N85-21736
NAS5-26819 ..... N85-22311
NAS5-27323 ..... N85-21755
NAS5-27371 ..... N85-21742
NAS5-27382 ..... N85-21733
N85-21756
NAS5-27663 ..... N85-21894
NAS5-27791 ..... N85-21439
NAS5-27800 ..... N85-21759
NAS5-28117 ..... N85-22044
NAS7-100 ..... N85-22178
NAS7-918 ..... N85-21325
N85-21661
NAS8-30752 ..... N85-22288
NAS8-33513 ..... N85-21186
NAS8-33799 ..... N85-21876
NAS8-34733 ..... N85-21873
NAS8-35406 ..... N85-21659
NAS9-15566 ..... N85-21923
NAS9-15980 ..... N85-21675
NAS9-16023 ..... N85-21693
N85-21694
NAS9-16538 ..... N85-21747
NAS9-16671 ..... N85-21924
NB82-SBCA-1637 ..... N85-21383
N85-21384
N85-21385
N85-21386
N85-21387
NCC2-71 ..... N85-21271
NCC2-205 ..... N85-21752
NCC3-35 ..... N85-21283
NGL-05-020-014 ..... N85-22327
NGL-05-020-272 ..... N85-22330
NGL-16-001-043 ..... N85-22311
NGL-22-009-015 ..... N85-22272
NGL-33-018-003 ..... N85-21268
NGR-05-002-160 ..... N85-22337
NGR-05-020-688 ..... N85-22330
NGR-14-005-181 ..... N85-21850
NGR14-005-181 ..... N85-21851
NGR39-007-011 ..... N85-21692
NGT-01-002-099 ..... N85-22210
NIVR-1771 ..... N85-21254
NIVR-1858 ..... N85-21254
NR PROJ. 042-373 ..... N85-22100
NR PROJ. 051-848 ..... N85-21286
NR PROJ. 475-026 ..... N85-22085
NR PROJ. 633-844 ..... N85-21295
NSF AST-82-17714 ..... N85-22294
NSF AST-83-03522 ..... N85-22310
NSF ATM-80-24257 ..... N85-21865
NSF ATM-82-14730 ..... N85-22291
NSF ATM-83-1491 ..... N85-22333
NSF CEE-83-08329 ..... N85-21717
NSF DMS-82-10950 ..... N85-22058
NSF DMS-83-12229 ..... N85-21704
N85-22063
NSF ECS-82-17668 ..... N85-22068
NSF ECS-83-04442 ..... N85-21528
NSF ECS-83-06871 ..... N85-21706
NSF ECS-83-12142 ..... N85-22028
NSF IST-79-11190 ..... N85-22260
NSF IST-81-11497 ..... N85-22260
NSF MCS-79-18209 ..... N85-21612
NSF MCS-79-26009 ..... N85-22028
NSF MCS-80-24649 ..... N85-22100
NSF MCS-82-0L306 ..... N85-21704
NSF MCS-82-03483 ..... N85-22070
NSF MCS-82-07965 ..... N85-21589
NSF MCS-82-43730 ..... N85-21589
NSF MCS-83-01628 ..... N85-22058
NSF MEA-81-12629 ..... N85-22041
NSF MSS-82-10950 ..... N85-22092
NSF OIR-83-14417 ..... N85-22155
NSF PHY-83-08072 ..... N85-21625
NSF PRA-83-02137-826 ..... N85-21668
NSG-1490 ..... N85-21150
NSG-1601 ..... N85-21269
NSG-3208 ..... N85-21117
NSG-3301 ..... N85-21250
NSG-3328 ..... N85-21673
NSG-5242 ..... N85-22269
NSG-7405 ..... N85-22330
NSG-7539 ..... N85-22326
N00014-75-C-0267 ..... N85-22028
N00014-75-C-0455 ..... N85-22249
N00014-75-C-0459 ..... N85-21612
N85-22148
N00014-75-C-0491 ..... N85-22055
N00014-75-C-0621 ..... N85-22060
N00014-76-C-0225 ..... N85-21473
N00014-76-C-0390 ..... N85-21285
N00014-76-C-0444 ..... N85-21252
N00014-76-C-0472 ..... N85-21964
N00014-76-C-0475 ..... N85-22062
N00014-76-C-0847 ..... N85-21506
N00014-76-C-1105 ..... N85-21613
N00014-77-C-0292 ..... N85-21470
N00014-77-C-0306 ..... N85-22100
N00014-77-C-0532 ..... N85-22068
N85-22251
N00014-77-C-0623 ..... N85-21704
N85-22063
N00014-78-C-0479 ..... N85-21855
N00014-79-C-0066 ..... N85-22143
N00014-79-C-0312 ..... N85-21640
N00014-80-C-0031 ..... N85-21583
N00014-80-C-0143 ..... N85-21475
N00014-80-C-0768 ..... N85-21920
N00014-81-C-044 ..... N85-22252
N00014-81-C-0017 ..... N85-22248
N00014-81-C-0359 ..... N85-21901
N00014-81-C-0671 ..... N85-21927
N00014-81-K-0003 ..... N85-22067
N00014-81-K-0373 ..... N85-22055
N85-22056
N85-22110
N00014-81-K-0503 ..... N85-22152
N00014-81-K-0668 ..... N85-21711
N00014-82-C-0001 ..... N85-22083
N85-22250
N00014-82-C-0452 ..... N85-21464
N00014-82-C-0466 ..... N85-21582
N00014-82-C-0563 ..... N85-21286
N85-21294
N00014-82-C-0617 ..... N85-22185
N00014-82-C-0697 ..... N85-22186
N00014-82-F-0123 ..... N85-21514
N00014-82-K-0190 ..... N85-21369
N00014-82-K-0464 ..... N85-22148
N00014-82-K-0485 ..... N85-21328
N00014-82-K-0576 ..... N85-21290
N00014-82-K-0597 ..... N85-21327
N00014-83-C-0170 ..... N85-21287
N00014-83-C-0684 ..... N85-22111
N00014-83-C-0710 ..... N85-21295
N00014-83-C-2231 ..... N85-21899
N00014-83-D-0689 ..... N85-22027
N00014-83-K-0002 ..... N85-21895
N00014-83-K-0126 ..... N85-21709
N00014-83-K-0480 ..... N85-22085
N00014-83-K-0536 ..... N85-21704

N85-22063
N00014-83-K-0560 ..... N85-22026
N00014-83-K-0609 ..... N85-21286
N00014-83-K-0611 ..... N85-21374
N00014-83-K-0612 ..... N85-22183
N85-22184
N85-22187
N00014-83-K-0637 ..... N85-21291
N00014-84-C-0167 ..... N85-22249
N00014-84-C-0169 ..... N85-22061
N85-22062
N00014-84-C-0187 ..... N85-21918
N00014-84-G-0100 ..... N85-22180
N00014-84-G-0130 ..... N85-21981
N00014-84-K-0049 ..... N85-21858
N00014-84-K-0073 ..... N85-22153
N00014-84-K-0244 ..... N85-21680
N00014-84-K-0519 ..... N85-22251
N00014-85-I-0111 ..... N85-22330
N00014-830-G-0072 ..... N85-21490
N00019-82-C-0448 ..... N85-21854
N00019-83-C-0058 ..... N85-21504
N00024-79-C-6043 ..... N85-21585
N00024-81-C-6042 ..... N85-22112
N00024-83-C-5301 ..... N85-21965
N00039-81-C-0654 ..... N85-21480
N00123-78-C-0074 ..... N85-21454
N00167-84-C-0018 ..... N85-21961
N00228-82-C-6222 ..... N85-21900
N00600-77-C-1291 ..... N85-21408
N68335-81-C-5142 ..... N85-21155
PROJ. AGRISTARS N85-21748
N85-21749
N85-21750
N85-21751
PROJ. 160-1 ..... N85-21415
RR0-1107 ..... N85-21506
N85-21640
RR0-2105 ..... N85-21614
STW-CWI-22.0348 ..... N85-22075
W-31-109-ENG-38 ..... N85-21333
N85-21625
N85-22016
N85-22033
N85-22034
N85-22122
N85-22166
N85-22169
N85-22206
W-310-109-ENG-38 ..... N85-21628
W-7405-ENG-26 ..... N85-21817
W-7405-ENG-35 ..... N85-21862
W-7405-ENG-36 ..... N85-21376
N85-21402
N85-21403
N85-21440
N85-21576
N85-21589
N85-21629
N85-21638
N85-21861
N85-21863
N85-21903
N85-22006
N85-22007
N85-22008
N85-22009
N85-22010
N85-22011
N85-22012
N85-22013
N85-22014
N85-22015
N85-22016
N85-22030
N85-22047
N85-22052
N85-22072
N85-22113
N85-22125
N85-22128
N85-22129
N85-22131
N85-22134
N85-22138
N85-22195
W-7405-ENG-48 ..... N85-21338
N85-21521
N85-21621
N85-21646
N85-21647
N85-21681
N85-21715
N85-21864
N85-21904
N85-22029
N85-22170
N85-22322
W-7405-ENG-82 ..... N85-22194
WR0-2101 ..... N85-21504
ZR0-0001 ..... N85-21702
199-22-40 ..... N85-21925
481-01-02 ..... N85-21259
505-31-04 ..... N85-21164
505-31-42 ..... N85-22204
505-31-53 ..... N85-21606
505-31-83 ..... N85-21575
N85-21991
N85-22003
N85-22050
N85-22051
505-31-83-01 ..... N85-22049
505-33-1A N85-21322
505-33-5B N85-21273
505-33-7C N85-21658
N85-21685
505-33-33 ..... N85-21270
505-33-43 ..... N85-21116
N85-21689
505-33-53 ..... N85-22109
505-33-62 ..... N85-21323
N85-21357
N85-21657
505-34-03 ..... N85-21176
505-40-68 ..... N85-21163
505-40-90 ..... N85-21114
505-43-23 ..... N85-21120
505-43-43 ..... N85-21119
505-43-52 ..... N85-21168
505-45-13-02 ..... N85-21677
505-45-43 ..... N85-21118
505-45-58 ..... N85-22108
506-51-13-03 ..... N85-21573
506-53-1A N85-21673
506-53-1B N85-21264
N85-21355
N85-21359
506-53-53 ..... N85-21150
506-53-53-07 ..... N85-21695
506-55-22 ..... N85-21258
N85-21263
N85-21662
506-55-24 ..... N85-21260
506-55-42 ..... N85-21261
506-60-12 ..... N85-21231
506-60-42 ..... N85-21228
N85-21574
533-04-1A N85-21605
N85-21686
533-04-1C N85-21358
533-04-12 ..... N85-21321
N85-21691
533-05-12 ..... N85-21356
N85-21674
535-06-12 ..... N85-21115
619-12-01-01 ..... N85-22002
672-40-04-70 ..... N85-21874
906-63-00 ..... N85-21262
906-75-22 ..... N85-21188
953-36-00 ..... N85-21675

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-9468 ..... N85-21149* #
A-85144 ..... N85-21925* #
A-85148 ..... N85-21572* #
A-85153 ..... N85-21174* #

AAAF-NT-83-16 ..... N85-21110* #

AAE-85-2 ..... N85-21283* #

AAF-PAPER-NT-82-01 ..... N85-21169* #

AD-A130486 ..... N85-21579 #
AD-A149125 ..... N85-21444 #
AD-A149571 ..... N85-21612 #
AD-A149572 ..... N85-21103 #
AD-A149574 ..... N85-21853 #
AD-A149592 ..... N85-22098 #
AD-A149593 ..... N85-21677 #
AD-A149595 ..... N85-21917 #
AD-A149596 ..... N85-21158 #
AD-A149597 ..... N85-21399 #
AD-A149598 ..... N85-22110 #
AD-A149599 ..... N85-22055 #
AD-A149600 ..... N85-22056 #
AD-A149605 ..... N85-21385 #
AD-A149606 ..... N85-21137 #
AD-A149609 ..... N85-21327 #
AD-A149611 ..... N85-22180 #
AD-A149612 ..... N85-22019 #
AD-A149613 ..... N85-21284 #
AD-A149614 ..... N85-21104 #
AD-A149616 ..... N85-21640 #
AD-A149619 ..... N85-21702 #
AD-A149621 ..... N85-22248 #
AD-A149622 ..... N85-21155 #
AD-A149623 ..... N85-21504 #
AD-A149624 ..... N85-22057 #
AD-A149625 ..... N85-21678 #
AD-A149626 ..... N85-21505 #
AD-A149628 ..... N85-21895 #
AD-A149629 ..... N85-21996 #
AD-A149633 ..... N85-22092 #
AD-A149634 ..... N85-22058 #
AD-A149637 ..... N85-21613 #
AD-A149638 ..... N85-21470 #
AD-A149640 ..... N85-21285 #
AD-A149641 ..... N85-21159 #
AD-A149646 ..... N85-21760 #
AD-A149647 ..... N85-21981 #
AD-A149650 ..... N85-22059 #
AD-A149651 ..... N85-22181 #
AD-A149653 ..... N85-21641 #
AD-A149654 ..... N85-21138 #
AD-A149656 ..... N85-21170 #
AD-A149657 ..... N85-21580 #
AD-A149659 ..... N85-21286 #
AD-A149662 ..... N85-21978 #
AD-A149663 ..... N85-22060 #
AD-A149666 ..... N85-21854 #
AD-A149668 ..... N85-21896 #
AD-A149682 ..... N85-21506 #
AD-A149684 ..... N85-21507 #
AD-A149685 ..... N85-21508 #
AD-A149686 ..... N85-21642 #
AD-A149687 ..... N85-21614 #
AD-A149688 ..... N85-22183 #
AD-A149689 ..... N85-21643 #
AD-A149690 ..... N85-22143 #
AD-A149694 ..... N85-22020 #
AD-A149696 ..... N85-21988 #
AD-A149699 ..... N85-21509 #
AD-A149701 ..... N85-21408 #
AD-A149702 ..... N85-22144 #
AD-A149704 ..... N85-21918 #
AD-A149705 ..... N85-22061 #
AD-A149706 ..... N85-22062 #
AD-A149715 ..... N85-22021 #
AD-A149717 ..... N85-21471 #
AD-A149718 ..... N85-21982 #
AD-A149722 ..... N85-21979 #
AD-A149725 ..... N85-21855 #
AD-A149726 ..... N85-22145 #
AD-A149727 ..... N85-21996 #
AD-A149728 ..... N85-21252 #
AD-A149734 ..... N85-21235 #
AD-A149737 ..... N85-22089 #
AD-A149738 ..... N85-21400 #
AD-A149739 ..... N85-21366 #
AD-A149740 ..... N85-21472 #
AD-A149741 ..... N85-21703 #
AD-A149742 ..... N85-21177 #
AD-A149745 ..... N85-21287 #
AD-A149747 ..... N85-22182 #
AD-A149748 ..... N85-21704 #
AD-A149749 ..... N85-22062 #
AD-A149750 ..... N85-22063 #
AD-A149751 ..... N85-21288 #
AD-A149752 ..... N85-22022 #
AD-A149755 ..... N85-22063 #
AD-A149756 ..... N85-21367 #
AD-A149759 ..... N85-21289 #
AD-A149760 ..... N85-21290 #
AD-A149761 ..... N85-21510 #
AD-A149762 ..... N85-21473 #
AD-A149764 ..... N85-21474 #
AD-A149765 ..... N85-22023 #
AD-A149771 ..... N85-21856 #
AD-A149777 ..... N85-21368 #
AD-A149778 ..... N85-21156 #
AD-A149779 ..... N85-21644 #
AD-A149780 ..... N85-21122 #
AD-A149781 ..... N85-22249 #
AD-A149782 ..... N85-21511 #
AD-A149783 ..... N85-21512 #
AD-A149784 ..... N85-21997 #
AD-A149785 ..... N85-21513 #
AD-A149786 ..... N85-21123 #
AD-A149787 ..... N85-22257 #
AD-A149791 ..... N85-21369 #
AD-A149797 ..... N85-21139 #
AD-A149799 ..... N85-21615 #
AD-A149800 ..... N85-21140 #
AD-A149801 ..... N85-21274 #
AD-A149802 ..... N85-21919 #
AD-A149803 ..... N85-21705 #
AD-A149805 ..... N85-21328 #
AD-A149808 ..... N85-21761 #
AD-A149809 ..... N85-21475 #
AD-A149810 ..... N85-21275 #
AD-A149812 ..... N85-22064 #
AD-A149813 ..... N85-21291 #
AD-A149817 ..... N85-21706 #
AD-A149818 ..... N85-22065 #
AD-A149819 ..... N85-22066 #
AD-A149820 ..... N85-21476 #
AD-A149823 ..... N85-21997 #
AD-A149824 ..... N85-22067 #
AD-A149825 ..... N85-21581 #
AD-A149826 ..... N85-21994 #
AD-A149828 ..... N85-21514 #
AD-A149831 ..... N85-21920 #
AD-A149842 ..... N85-21707 #
AD-A149843 ..... N85-21329 #
AD-A149846 ..... N85-21708 #
AD-A149848 ..... N85-21276 #
AD-A149849 ..... N85-21292 #
AD-A149851 ..... N85-21582 #
AD-A149869 ..... N85-22111 #
AD-A149870 ..... N85-22250 #
AD-A149871 ..... N85-21679 #
AD-A149934 ..... N85-21401 #
AD-A149935 ..... N85-21370 #
AD-A149936 ..... N85-21477 #
AD-A149938 ..... N85-21983 #
AD-A149947 ..... N85-21330 #
AD-A149948 ..... N85-22024 #
AD-A149949 ..... N85-22045 #
AD-A149954 ..... N85-22025 #
AD-A149955 ..... N85-22043 #
AD-A149956 ..... N85-21141 #
AD-A149957 ..... N85-21857 #
AD-A149958 ..... N85-21142 #
AD-A149959 ..... N85-21371 #
AD-A149960 ..... N85-22084 #
AD-A149961 ..... N85-21372 #
AD-A149963 ..... N85-21898 #
AD-A149969 ..... N85-21583 #
AD-A149971 ..... N85-21989 #
AD-A149972 ..... N85-22060 #
AD-A149979 ..... N85-21143 #
AD-A149980 ..... N85-22146 #
AD-A149981 ..... N85-22147 #
AD-A149982 ..... N85-21980 #
AD-A149983 ..... N85-22099 #
AD-A149984 ..... N85-22148 #
AD-A149985 ..... N85-21899 #
AD-A149989 ..... N85-21665 #
AD-A149992 ..... N85-21616 #
AD-A149993 ..... N85-21124 #
AD-A149995 ..... N85-21927 #
AD-A149996 ..... N85-21709 #
AD-A149997 ..... N85-22068 #
AD-A150000 ..... N85-22183 #
AD-A150001 ..... N85-22184 #
AD-A150003 ..... N85-21660 #
AD-A150004 ..... N85-21515 #
AD-A150005 ..... N85-22069 #
AD-A150006 ..... N85-21373 #
AD-A150007 ..... N85-21253 #
AD-A150009 ..... N85-22026 #
AD-A150010 ..... N85-22185 #
AD-A150015 ..... N85-21762 #
AD-A150019 ..... N85-21584 #
AD-A150020 ..... N85-22186 #
AD-A150021 ..... N85-21125 #
AD-A150022 ..... N85-22258 #
AD-A150023 ..... N85-22149 #
AD-A150025 ..... N85-22251 #
AD-A150026 ..... N85-21331 #
AD-A150030 ..... N85-22150 #
AD-A150031 ..... N85-21981 #
AD-A150036 ..... N85-21374 #
AD-A150038 ..... N85-22151 #
AD-A150039 ..... N85-21964 #
AD-A150040 ..... N85-21236 #
AD-A150042 ..... N85-21710 #
AD-A150043 ..... N85-21962 #
AD-A150044 ..... N85-21180 #
AD-A150048 ..... N85-21965 #
AD-A150050 ..... N85-22152 #
AD-A150051 ..... N85-21144 #
AD-A150052 ..... N85-21666 #
AD-A150053 ..... N85-21277 #
AD-A150057 ..... N85-21667 #
AD-A150059 ..... N85-21645 #
AD-A150060 ..... N85-21668 #
AD-A150061 ..... N85-21669 #
AD-A150062 ..... N85-21669 #
AD-A150063 ..... N85-21586 #
AD-A150065 ..... N85-22095 #
AD-A150067 ..... N85-21515 #
AD-A150068 ..... N85-22115 #
AD-A150070 ..... N85-21478 #
AD-A150071 ..... N85-22027 #
AD-A150072 ..... N85-21332 #
AD-A150073 ..... N85-22096 #
AD-A150075 ..... N85-21293 #

AD-A150078 ..... N85-22026 #
AD-A150079 ..... N85-21586 #
AD-A150080 ..... N85-21587 #
AD-A150081 ..... N85-21999 #
AD-A150082 ..... N85-21858 #
AD-A150083 ..... N85-21265 #
AD-A150084 ..... N85-21479 #
AD-A150086 ..... N85-21588 #
AD-A150087 ..... N85-21480 #
AD-A150090 ..... N85-21517 #
AD-A150091 ..... N85-21711 #
AD-A150094 ..... N85-21481 #
AD-A150095 ..... N85-21482 #
AD-A150096 ..... N85-22100 #
AD-A150097 ..... N85-21900 #
AD-A150098 ..... N85-21483 #
AD-A150100 ..... N85-21966 #
AD-A150105 ..... N85-21859 #
AD-A150106 ..... N85-22087 #
AD-A150107 ..... N85-22116 #
AD-A150108 ..... N85-21901 #
AD-A150109 ..... N85-21294 #
AD-A150111 ..... N85-21295 #
AD-A150112 ..... N85-22070 #
AD-A150114 ..... N85-21860 #
AD-A150115 ..... N85-22112 #
AD-A150116 ..... N85-21296 #
AD-A150117 ..... N85-21375 #
AD-A150119 ..... N85-21297 #
AD-A150120 ..... N85-21298 #
AD-A150121 ..... N85-21928 #
AD-A150123 ..... N85-21126 #
AD-A150129 ..... N85-22153 #
AD-A150130 ..... N85-22046 #
AD-A150131 ..... N85-22187 #
AD-A150132 ..... N85-21967 #

AD-B089301L ..... N85-21308 #
AD-B089311L ..... N85-21171 #

AD-D011486 ..... N85-22188 #
AD-D011497 ..... N85-22189 #
AD-D011498 ..... N85-21653
AD-D011499 ..... N85-21632
AD-D011500 ..... N85-21494
AD-D011502 ..... N85-21390
AD-D011503 ..... N85-21495
AD-D011505 ..... N85-21496
AD-D011506 ..... N85-21633
AD-D011507 ..... N85-21148
AD-D011508 ..... N85-21391
AD-D011510 ..... N85-21172
AD-D011511 ..... N85-21392
AD-D011512 ..... N85-21984
AD-D011513 ..... N85-21634
AD-D011514 ..... N85-21393
AD-D011515 ..... N85-21993
AD-D011516 ..... N85-21394
AD-D011517 ..... N85-21395
AD-D011518 ..... N85-21318
AD-D011519 ..... N85-21635
AD-D011520 ..... N85-21599
AD-D011521 ..... N85-22106
AD-D011524 ..... N85-21497
AD-D011525 ..... N85-21654
AD-D011526 ..... N85-21353
AD-D011527 ..... N85-21354
AD-D011529 ..... N85-21600
AD-D011530 ..... N85-21433
AD-D011531 ..... N85-21601
AD-D011532 ..... N85-22175
AD-D011533 ..... N85-21434
AD-D011534 ..... N85-21498
AD-D011535 ..... N85-21499
AD-D011536 ..... N85-22176
AD-D011537 ..... N85-21500
AD-D011538 ..... N85-21655
AD-D011540 ..... N85-22140
AD-D011541 ..... N85-22141
AD-D011543 ..... N85-21396
AD-D011544 ..... N85-21656
AD-D011545 ..... N85-22156
AD-D011546 ..... N85-21405
AD-D011548 ..... N85-21281
AD-D011549 ..... N85-21161
AD-D011550 ..... N85-21636
AD-D011551 ..... N85-22142
AD-D011552 ..... N85-21602
AD-D011553 ..... N85-21257
AD-D011554 ..... N85-21603
AD-D011555 ..... N85-21637
AD-D011556 ..... N85-22107
AD-D011557 ..... N85-22177
AD-D011558 ..... N85-21435
AD-D011560 ..... N85-21501
AD-D011561 ..... N85-21436

AD-D011562 ..... N85-21502
AD-D011563 ..... N85-21437
AD-D011568 ..... N85-21319

AD-E001740 ..... N85-21854 #
AD-E001789 ..... N85-21899 #
AD-E001789 ..... N85-22148 #
AD-E440264 ..... N85-21329 #
AD-E440265 ..... N85-22021 #
AD-E450012 ..... N85-22060 #

AD-F300549 ..... N85-21665 #
AD-F300551 ..... N85-21707 #
AD-F300554 ..... N85-21708 #

AD-P004351 ..... N85-21445 #
AD-P004352 ..... N85-21446 #
AD-P004353 ..... N85-21447 #
AD-P004354 ..... N85-21448 #
AD-P004355 ..... N85-21449 #
AD-P004356 ..... N85-21450 #
AD-P004357 ..... N85-21451 #
AD-P004358 ..... N85-21452 #
AD-P004359 ..... N85-21453 #
AD-P004360 ..... N85-21454 #
AD-P004361 ..... N85-21455 #
AD-P004362 ..... N85-21456 #
AD-P004363 ..... N85-21457 #
AD-P004364 ..... N85-21458 #
AD-P004365 ..... N85-21459 #
AD-P004366 ..... N85-21460 #
AD-P004367 ..... N85-21461 #
AD-P004368 ..... N85-21462 #
AD-P004369 ..... N85-21463 #
AD-P004370 ..... N85-21464 #
AD-P004371 ..... N85-21465 #
AD-P004372 ..... N85-21466 #
AD-P004373 ..... N85-21467 #
AD-P004374 ..... N85-21468 #
AD-P004375 ..... N85-21469 #

AERE-M-3445 ..... N85-21316 #

AERE-R-10549 ..... N85-22173 #
AERE-R-11034 ..... N85-21315 #
AERE-R-11289 ..... N85-21721 #
AERE-R-11384 ..... N85-21317 #
AERE-R-11409 ..... N85-21683 #
AERE-R-11415 ..... N85-21722 #

AERE-R11483 ..... N85-22203 #

AEROCHEM-TP-443 ..... N85-21297 #

AFAMRL-TR-84-022 ..... N85-21979 #
AFAMRL-TR-84-055 ..... N85-21472 #

AFESC/ESL-TR-84-18-VOL-1 ..... N85-21399 #

AFHRL-TR-84-27 ..... N85-21159 #

AFLRL-183 ..... N85-21289 #

AFOSR-80-1186TR ..... N85-21284 #
AFOSR-84-1140TR ..... N85-21516 #
AFOSR-84-1174TR ..... N85-21126 #
AFOSR-84-1175TR ..... N85-21580 #
AFOSR-84-1178TR ..... N85-22182 #
AFOSR-84-1180TR ..... N85-22059 #
AFOSR-84-1181TR ..... N85-22064 #
AFOSR-84-1182TR ..... N85-22098 #
AFOSR-84-1183TR ..... N85-21999 #
AFOSR-84-1184TR ..... N85-21476 #
AFOSR-84-1196TR ..... N85-21170 #
AFOSR-84-1197TR ..... N85-21123 #
AFOSR-84-1200TR ..... N85-22066 #
AFOSR-84-1202TR ..... N85-21706 #
AFOSR-84-1203TR ..... N85-21677 #
AFOSR-84-1206TR ..... N85-21853 #
AFOSR-84-1208TR ..... N85-21297 #
AFOSR-84-1209TR ..... N85-21581 #
AFOSR-84-1212TR ..... N85-21967 #
AFOSR-84-1215TR ..... N85-22065 #
AFOSR-84-1217TR ..... N85-21477 #
AFOSR-84-1219TR ..... N85-22149 #
AFOSR-84-1224TR ..... N85-22116 #
AFOSR-84-1228TR ..... N85-21587 #
AFOSR-84-1229TR ..... N85-21274 #
AFOSR-84-1230TR ..... N85-21483 #
AFOSR-84-1231TR ..... N85-21276 #
AFOSR-84-1233TR ..... N85-22181 #
AFOSR-84-1235TR ..... N85-21511 #
AFOSR-84-1237TR ..... N85-21371 #
AFOSR-84-1238TR ..... N85-22115 #
AFOSR-84-1243TR ..... N85-21124 #
AFOSR-84-1255TR ..... N85-21860 #

AFOSR-84-1258TR ..... N85-21616 #
AFOSR-84-1260TR ..... N85-21588 #
AFOSR-84-1268TR ..... N85-21510 #
AFOSR-84-1269TR ..... N85-22046 #
AFOSR-84-1270TR ..... N85-22099 #

AFWAL-TR-83-3039-PT-2 ..... N85-21579 #
AFWAL-TR-84-2045 ..... N85-21292 #
AFWAL-TR-84-3054 ..... N85-21235 #
AFWAL-TR-84-3056 ..... N85-21277 #
AFWAL-TR-84-3068 ..... N85-21177 #
AFWAL-TR-84-4046 ..... N85-21372 #
AFWAL-TR-84-4067 ..... N85-21367 #
AFWAL-TR-84-4104 ..... N85-21275 #
AFWAL-TR-84-4120 ..... N85-21678 #

AGARD-AR-194 ..... N85-21969 #
AGARD-AR-208 ..... N85-21157 #

AIAA-84-1732 ..... N85-21573* #
AIAA-85-0598-CP ..... N85-21116* #

AID-PN-AAL-336 ..... N85-22263 #

AMRC-R-663 ..... N85-22116 #

AMSMC/RD/MR-5 ..... N85-22069 #

ANL-MCS-TM-37 ..... N85-22033 #

ANL-84-27 ..... N85-22016 #

ANL/EES-TM-267 ..... N85-22169 #

ANL/FE-84-12 ..... N85-21628 #

ANL/FPP-TM-183 ..... N85-22166 #

ANL/MCS-TM-33 ..... N85-22034 #

APL-UW-7-83 ..... N85-22112 #

AR-003-010 ..... N85-21663 #
AR-003-929 ..... N85-21676 #
AR-003-931 ..... N85-21151 #
AR-003-937 ..... N85-21152 #
AR-003-940 ..... N85-21701 #
AR-003-941 ..... N85-21698 #
AR-003-943 ..... N85-21700 #
AR-003-955 ..... N85-21326 #
AR-004-195 ..... N85-22162 #
AR-113 ..... N85-21850* #
AR-114 ..... N85-21851* #

ARACOR-FR-84-246-1 ..... N85-21678 #

ARE/TN-720/84 ..... N85-21761 #

ARI-RN-85-12 ..... N85-21978 #

ARL-AERO-PROP-R-163 ..... N85-21663 #

ARL-AERO-PROP-TM-417 ..... N85-21122 #

ARL-AERO-R-161 ..... N85-21151 #

ARL-MAT-R-117 ..... N85-21326 #

ARL-STRUC-R-404 ..... N85-21676 #
ARL-STRUC-R-405 ..... N85-21152 #
ARL-STRUC-R-406 ..... N85-21701 #
ARL-STRUC-R-407 ..... N85-21698 #
ARL-STRUC-R-408 ..... N85-21699 #
ARL-STRUC-R-409 ..... N85-21700 #

ARL-STRUC-TM-384 ..... N85-21156 #

ARL-003-942 ..... N85-21699 #

ARL/PSU/TN-84-169 ..... N85-21585 #

ARLCB-CR-84034 ..... N85-21329 #

ARLCB-TR-84040 ..... N85-22021 #

ARO-15255.4-CH ..... N85-21331 #
ARO-17603.2-GS ..... N85-22150 #
ARO-17747.3-EG ..... N85-21586 #
ARO-17842.9-CH ..... N85-21265 #
ARO-17899.6-CH ..... N85-21331 #
ARO-18124.7-CH ..... N85-21298 #
ARO-18439.12-CH ..... N85-21296 #
ARO-18529.29-LS ..... N85-21928 #
ARO-19085.10-MA ..... N85-22084 #
ARO-19442.21-MA ..... N85-22086 #
ARO-19608.1-PH ..... N85-21481 #

ARO-19775.3-MS ..... N85-21375 #
ARO-19778.15-EL ..... N85-21517 #
ARO-19893.4-GS ..... N85-21898 #
ARO-20577.5-PH ..... N85-21293 #
ARO-20927.5-MA ..... N85-22070 #
ARO-21165.1-EG ..... N85-21401 #
ARO-21592.3-MA ..... N85-22028 #
ARO-21779.1-MA ..... N85-22087 #
ARO-21807.1-MS-CF-PT-2 ..... N85-21444 #

ASR-1 ..... N85-21686* #

ATC-125 ..... N85-21136 #

BBC-RD-1984/16 ..... N85-21442
BBC-RD-1984/18 ..... N85-21432
BBC-RD-1984/19 ..... N85-21431
BBC-RD-1985/1 ..... N85-21443
BBC-RD-1985/2 ..... N85-21430

BM-RI-8900 ..... N85-21346 #

BMFT-FB-HA-84-044 ..... N85-21411 #

BMFT-FB-T-84-209 ..... N85-22202 #
BMFT-FB-T-84-219 ..... N85-21342 #
BMFT-FB-T-84-234 ..... N85-21812 #
BMFT-FB-T-84-236 ..... N85-21672 #
BMFT-FB-T-84-240 ..... N85-21345 #
BMFT-FB-T-84-242 ..... N85-21343 #
BMFT-FB-T-84-243 ..... N85-21380 #
BMFT-FB-T-84-244 ..... N85-21344 #
BMFT-FB-T-84-250 ..... N85-21828 #

BMFT-FB-W-84-045 ..... N85-21227 #
BMFT-FB-W-84-046 ..... N85-21238 #
BMFT-FB-W-84-047 ..... N85-21145 #
BMFT-FB-W-84-048 ..... N85-21866 #
BMFT-FB-W-84-049 ..... N85-21239 #

BMI-2118 ..... N85-21379 #

BN-1028 ..... N85-22063 #
BN-1033 ..... N85-21704 #

BNL-34491 ..... N85-22154 #
BNL-34527 ..... N85-22194 #
BNL-35128 ..... N85-22192 #
BNL-35208 ..... N85-21819 #
BNL-35373 ..... N85-22191 #
BNL-35424 ..... N85-21335 #
BNL-35438 ..... N85-22124 #
BNL-35458 ..... N85-21300 #
BNL-35480 ..... N85-22197 #
BNL-35482 ..... N85-22198 #
BNL-51757-VOL-1 ..... N85-21822 #
BNL-51757-VOL-2 ..... N85-21823 #

BONN-IR-83-17 ..... N85-22329 #

BRL-CR-534 ..... N85-21707 #
BRL-CR-535 ..... N85-21708 #

BRL-MR-3415 ..... N85-21665 #

B8475632 ..... N85-22036 #
B8477105 ..... N85-21905 #
B8477222-PT-2 ..... N85-21254 #
B8478512 ..... N85-21593 #
B8478513 ..... N85-21130 #
B8478780 ..... N85-22075 #
B8478782 ..... N85-22076 #
B8478783 ..... N85-22097 #
B8478825 ..... N85-22094 #
B8478826 ..... N85-22093 #
B8478829 ..... N85-22096 #
B8478830 ..... N85-22074 #
B8478831 ..... N85-22095 #

CALSPAN-6856-A-2 ..... N85-21586 #
CALSPAN-6962-M-1 ..... N85-21927 #
CALSPAN-7018-A-2 ..... N85-21587 #

CAR-TR-98 ..... N85-22064 #

CDC-0330284TR-DA09-AC004 ..... N85-21253 #

CERC-84-6 ..... N85-21896 #

CERL-IR-E-200 ..... N85-21400 #

CERL-SR-M-85/07 ..... N85-21366 #

CERL-TR-M-85/08 ..... N85-21703 #

CMU-RI-TR-84-13 ..... N85-21998 #
CMU-RI-TR-84-15 ..... N85-22146 #
CMU-RI-TR-84-16 ..... N85-21667 #
CMU-RI-TR-84-17 ..... N85-22152 #
CMU-RI-TR-84-18 ..... N85-21144 #
CMU-RI-TR-84-19 ..... N85-22090 #
CMU-RI-TR-84-21 ..... N85-22045 #
CMU-RI-TR-84-22 ..... N85-21980 #
CMU-RI-TR-84-23 ..... N85-21668 #
CMU-RI-TR-84-24 ..... N85-21669 #
CMU-RI-TR-84-25 ..... N85-21679 #
CMU-RI-TR-84-26 ..... N85-21989 #
CMU-RI-TR-84-27 ..... N85-21143 #
CMU-RI-TR-84-28 ..... N85-21666 #
CMU-RI-TR-84-29 ..... N85-22147 #

COINS-TR-84-04 ..... N85-21612 #
COINS-TR-84-05 ..... N85-22148 #

COLL-AERON-8413 ..... N85-21175 #
COLL-AERON-8434 ..... N85-21282 #
COLL-AERON-8501 ..... N85-21848 #

CONF-831240 ..... N85-21763 #
CONF-840113-10 ..... N85-22134 #
CONF-840180-SUMM ..... N85-21820 #
CONF-840183-1 ..... N85-22322 #
CONF-840257-VOL-1 ..... N85-22132 #
CONF-840257-VOL-2 ..... N85-22133 #
CONF-840489-VOL-1-SUMM ..... N85-21822 #
CONF-840489-VOL-2-SUMM ..... N85-21823 #
CONF-840738-8 ..... N85-21681 #
CONF-840819-11 ..... N85-21378 #
CONF-840842-31 ..... N85-21622 #
CONF-840922-14 ..... N85-22165 #
CONF-840922-19 ..... N85-21620 #
CONF-840937-21 ..... N85-22191 #
CONF-840981-4 ..... N85-22101 #
CONF-841005-3 ..... N85-21625 #
CONF-841007-33 ..... N85-21526 #
CONF-841010-11 ..... N85-22168 #
CONF-841071-2 ..... N85-21805 #
CONF-841117-16 ..... N85-22122 #
CONF-841157-24 ..... N85-22200 #
CONF-841184-4 ..... N85-22206 #
CONF-841184-15 ..... N85-21336 #
CONF-841184-18 ..... N85-21335 #
CONF-841184-20 ..... N85-22195 #
CONF-841184-21 ..... N85-22197 #
CONF-841184-22 ..... N85-22198 #
CONF-841184-23 ..... N85-22194 #
CONF-841201-18 ..... N85-21800 #
CONF-841203-3 ..... N85-21715 #
CONF-841214-1 ..... N85-22154 #
CONF-841217-1 ..... N85-21921 #
CONF-841218-2 ..... N85-21521 #
CONF-841218-7 ..... N85-22167 #
CONF-841218-12 ..... N85-21629 #
CONF-841218-14 ..... N85-22170 #
CONF-841246-2 ..... N85-21333 #
CONF-850118-5 ..... N85-21618 #
CONF-850131-1 ..... N85-22047 #
CONF-850132-1 ..... N85-21862 #
CONF-850211-1 ..... N85-21339 #
CONF-850218-3 ..... N85-21714 #
CONF-8307141-1 ..... N85-22116 #
CONF-8403101 ..... N85-22130 #
CONF-8403130-5 ..... N85-22119 #
CONF-8403146-5 ..... N85-21806 #
CONF-8404197-1 ..... N85-22190 #
CONF-8405221-3 ..... N85-21589 #
CONF-8405240-2 ..... N85-21863 #
CONF-8405248-1 ..... N85-21819 #
CONF-8406225-1 ..... N85-22072 #
CONF-8407102-1-DRAFT ..... N85-22193 #
CONF-8408110-4 ..... N85-22123 #
CONF-8408113-1 ..... N85-21621 #
CONF-8408121-2 ..... N85-21861 #
CONF-8408135-1 ..... N85-21630 #
CONF-8409109-5 ..... N85-21624 #
CONF-8409115-18 ..... N85-22136 #
CONF-8409145-5 ..... N85-22113 #
CONF-8409153-3 ..... N85-21821 #
CONF-8409162-5 ..... N85-22127 #
CONF-8409163-1 ..... N85-21646 #
CONF-8409184-1 ..... N85-21904 #
CONF-8410142-17 ..... N85-21299 #
CONF-8410142-31 ..... N85-21626 #
CONF-8410142-64 ..... N85-21712 #
CONF-8410179-2 ..... N85-21811 #
CONF-8410181-1 ..... N85-21825 #
CONF-8410198-1 ..... N85-21338 #
CONF-8410200-1 ..... N85-22196 #
CONF-8410201-1 ..... N85-21647 #
CONF-8411119-2 ..... N85-22114 #
CONF-8411119-4 ..... N85-21337 #
CONF-8411120-1 ..... N85-22205 #
CONF-8411120-4 ..... N85-21670 #
CONF-8411124-1 ..... N85-21764 #

CONTRIB-87 ..... N85-21852 #

CRA-684-VOL-1 ..... N85-21383 #
CRA-684-VOL-2 ..... N85-21384 #
CRA-684-VOL-4 ..... N85-21385 #
CRA-684-VOL-5 ..... N85-21386 #
CRA-684-VOL-6 ..... N85-21387 #

CRC-1372 ..... N85-21247
CRC-1376 ..... N85-21429

CRC/APRAC/CAPA-21-80-04 ..... N85-21914 #

CRDC-CR-84097 ..... N85-21373 #
CRDC-CR-84098 ..... N85-21584 #

CRINC/RSL-TR-3311-3 ..... N85-21613 #

CS-TR-1455 ..... N85-22064 #

CSDL-R-1629 ..... N85-21693* #
CSDL-R-1675 ..... N85-21694* #

CSG-31 ..... N85-21513 #
CSG-33 ..... N85-21997 #
CSG-34 ..... N85-21512 #

CWI-MS-R8412 ..... N85-22076 #
CWI-MS-R8413 ..... N85-22097 #

CWI-NM-R8407 ..... N85-22036 #

CWI-OS-R8409 ..... N85-22075 #

CWI-PM-R8408 ..... N85-22093 #
CWI-PM-R8409 ..... N85-22094 #
CWI-PM-R8410 ..... N85-22095 #
CWI-PM-R8411 ..... N85-22096 #
CWI-PM-R8413 ..... N85-22074 #

CWP-021 ..... N85-21858 #

DE84-004510 ..... N85-21771 #
DE84-004521 ..... N85-21770 #
DE84-009291 ..... N85-21763 #
DE84-010542 ..... N85-22154 #
DE84-010813 ..... N85-21796 #
DE84-010931 ..... N85-21772 #
DE84-012130 ..... N85-22132 #
DE84-012278 ..... N85-21921 #
DE84-012694 ..... N85-22133 #
DE84-013028 ..... N85-21800 #
DE84-013039 ..... N85-21377 #
DE84-013049 ..... N85-21378 #
DE84-016460 ..... N85-22134 #
DE85-000181 ..... N85-21807 #
DE85-000257 ..... N85-21623 #
DE85-000365 ..... N85-21804 #
DE85-000467 ..... N85-21618 #
DE85-000529 ..... N85-21805 #
DE85-000530 ..... N85-21714 #
DE85-000564 ..... N85-21671 #
DE85-000566 ..... N85-21819 #
DE85-000599 ..... N85-21522 #
DE85-000611 ..... N85-21299 #
DE85-000654 ..... N85-21661 #
DE85-000662 ..... N85-22121 #
DE85-000672 ..... N85-21622 #
DE85-000685 ..... N85-22190 #
DE85-000810 ..... N85-21624 #
DE85-000836 ..... N85-21278 #
DE85-000861 ..... N85-21521 #
DE85-000862 ..... N85-21646 #
DE85-000887 ..... N85-22192 #
DE85-001031 ..... N85-21519 #
DE85-001032 ..... N85-21518 #
DE85-001050 ..... N85-22118 #
DE85-001068 ..... N85-21339 #
DE85-001074 ..... N85-21661 #
DE85-001097 ..... N85-21806 #
DE85-001285 ..... N85-22193 #
DE85-001327 ..... N85-21520 #
DE85-001328 ..... N85-22119 #
DE85-001394 ..... N85-21376 #
DE85-001623 ..... N85-21626 #
DE85-001723 ..... N85-22165 #
DE85-001742 ..... N85-21621 #
DE85-001815 ..... N85-21334 #
DE85-001828 ..... N85-22120 #
DE85-001843 ..... N85-22122 #
DE85-001973 ..... N85-22032 #
DE85-001974 ..... N85-22031 #
DE85-002016 ..... N85-22113 #

DE85-002209 ..... N85-21589 #
DE85-002252 ..... N85-21620 #
DE85-002303 ..... N85-22138 #
DE85-002325 ..... N85-21821 #
DE85-002352 ..... N85-21902 #
DE85-002432 ..... N85-22047 #
DE85-002434 ..... N85-21862 #
DE85-002457 ..... N85-21823 #
DE85-002503 ..... N85-21185 #
DE85-002587 ..... N85-22117 #
DE85-002603 ..... N85-21822 #
DE85-002713 ..... N85-21590 #
DE85-002736 ..... N85-22101 #
DE85-002739 ..... N85-22206 #
DE85-002771 ..... N85-21333 #
DE85-002781 ..... N85-21619 #
DE85-002792 ..... N85-21617 #
DE85-002822 ..... N85-21825 #
DE85-002975 ..... N85-21503 #
DE85-003003 ..... N85-21820 #
DE85-003079 ..... N85-22196 #
DE85-003082 ..... N85-21523 #
DE85-003142 ..... N85-21647 #
DE85-003148 ..... N85-21338 #
DE85-003212 ..... N85-22191 #
DE85-003226 ..... N85-21715 #
DE85-003249 ..... N85-21809 #
DE85-003259 ..... N85-22114 #
DE85-003260 ..... N85-21592 #
DE85-003274 ..... N85-21803 #
DE85-003284 ..... N85-21824 #
DE85-003294 ..... N85-21884 #
DE85-003306 ..... N85-22205 #
DE85-003309 ..... N85-21336 #
DE85-003335 ..... N85-22168 #
DE85-003456 ..... N85-22167 #
DE85-003466 ..... N85-22135 #
DE85-003467 ..... N85-21799 #
DE85-003479 ..... N85-21802 #
DE85-003489 ..... N85-21801 #
DE85-003531 ..... N85-21627 #
DE85-003533 ..... N85-22200 #
DE85-003545 ..... N85-21764 #
DE85-003558 ..... N85-21811 #
DE85-003599 ..... N85-21712 #
DE85-003606 ..... N85-21335 #
DE85-003623 ..... N85-22322 #
DE85-003633 ..... N85-21630 #
DE85-003663 ..... N85-21337 #
DE85-003715 ..... N85-22169 #
DE85-003724 ..... N85-22195 #
DE85-003727 ..... N85-22072 #
DE85-003734 ..... N85-21863 #
DE85-003750 ..... N85-21301 #
DE85-003774 ..... N85-21629 #
DE85-003794 ..... N85-22164 #
DE85-003812 ..... N85-21409 #
DE85-003913 ..... N85-21410 #
DE85-003927 ..... N85-21303 #
DE85-004008 ..... N85-22073 #
DE85-004029 ..... N85-21625 #
DE85-004115 ..... N85-21524 #
DE85-004159 ..... N85-21300 #
DE85-004164 ..... N85-22197 #
DE85-004165 ..... N85-22194 #
DE85-004192 ..... N85-22102 #
DE85-004207 ..... N85-22198 #
DE85-004285 ..... N85-21340 #
DE85-004286 ..... N85-22207 #
DE85-004296 ..... N85-21307 #
DE85-004306 ..... N85-21713 #
DE85-004319 ..... N85-21306 #
DE85-004322 ..... N85-21670 #
DE85-004345 ..... N85-21525 #
DE85-004349 ..... N85-22137 #
DE85-004350 ..... N85-21379 #
DE85-004373 ..... N85-21302 #
DE85-004384 ..... N85-21526 #
DE85-004390 ..... N85-22127 #
DE85-004422 ..... N85-21904 #
DE85-004423 ..... N85-22170 #
DE85-004430 ..... N85-21304 #
DE85-004432 ..... N85-22136 #
DE85-004435 ..... N85-22123 #
DE85-004447 ..... N85-22071 #
DE85-004452 ..... N85-22029 #
DE85-004462 ..... N85-22125 #
DE85-004530 ..... N85-22126 #
DE85-004568 ..... N85-22171 #
DE85-004572 ..... N85-21827 #
DE85-004597 ..... N85-21903 #
DE85-004598 ..... N85-22201 #
DE85-004601 ..... N85-22199 #
DE85-004610 ..... N85-21929 #
DE85-004628 ..... N85-21128 #
DE85-004642 ..... N85-22091 #
DE85-004643 ..... N85-21808 #
DE85-004653 ..... N85-21305 #
DE85-004661 ..... N85-22259 #
DE85-004684 ..... N85-22033 #
DE85-004685 ..... N85-22034 #
DE85-004692 ..... N85-21591 #
DE85-004696 ..... N85-21810 #
DE85-004825 ..... N85-22166 #
DE85-004834 ..... N85-21628 #
DE85-004907 ..... N85-21826 #
DE85-005138 ..... N85-22124 #
DE85-005159 ..... N85-21127 #
DE85-005188 ..... N85-21402 #
DE85-005195 ..... N85-21403 #
DE85-005234 ..... N85-22030 #

DFVLR-FB-84-40 ..... N85-21146 #
DFVLR-FB-84-42 ..... N85-21485 #

DFVLR-MITT-84-18 ..... N85-22035 #

DGT-25369-PT-1 ..... N85-21341 #

DOE/BC-10476/11 ..... N85-21306 #

DOE/CS-30569/30 ..... N85-21798 #
DOE/CS-40403/T1 ..... N85-21671 #

DOE/DP-40092/6 ..... N85-22120 #

DOE/ER-03285/47 ..... N85-22207 #
DOE/ER-04254/6 ..... N85-21303 #
DOE/ER-1038:/6 ..... N85-21340 #
DOE/ER-10419/T2 ..... N85-22137 #
DOE/ER-10513/T3 ..... N85-22126 #
DOE/ER-10598/5 ..... N85-21307 #
DOE/ER-10794/T1 ..... N85-21807 #
DOE/ER-13026/3 ..... N85-21799 #
DOE/ER-30059/1 ..... N85-22091 #
DOE/ER-40008/58 ..... N85-22119 #
DOE/ER-40015/3 ..... N85-22135 #
DOE/ER-45017/1 ..... N85-21627 #
DOE/ER-45021/2 ..... N85-21334 #
DOE/ER-45051/01 ..... N85-21713 #
DOE/ER-45055/6 ..... N85-22199 #
DOE/ER-45116/4 ..... N85-22201 #
DOE/ER-71128/T1 ..... N85-21301 #

DOE/EV-00936/1-VOL-1 ..... N85-21929 #
DOE/EV-110611/4 ..... N85-21916 #

DOE/METC-84/9 ..... N85-21763 #
DOE/METC-85-8 ..... N85-22032 #
DOE/METC-85/9 ..... N85-22031 #

DOE/NSB-0053 ..... N85-21817 #

DOE/OR-21400/3 ..... N85-21520 #

DOE/PC-60783/3 ..... N85-21302 #

DOE/RA-50153/T1 ..... N85-21503 #
DOE/RA-50241/T1 ..... N85-21804 #

DOE/SF-12197/T3 ..... N85-21591 #

DOT-TSC-FAA-81-21 ..... N85-21982 #
DOT-TSC-FAA-84-3 ..... N85-21103 #

DP-MS-84-113 ..... N85-21825 #

DPST-84-876 ..... N85-21592 #

DREV-4343/84 ..... N85-21641 #

DRIC-BR-92835 ..... N85-22257 #
DRIC-BR-93397 ..... N85-21761 #
DRIC-BR-93761 ..... N85-21137 #

DSTZT-84-R-03 ..... N85-21138 #

DTNSRDC-85/004 ..... N85-21408 #

DTNSRDC/SME-CR-19-84 ..... N85-21961 #

DTNSRDC/SME-84-51 ..... N85-21332 #

D6-52470 ..... N85-21507 #

E-1988 ..... N85-21162* #
E-2151 ..... N85-22255* #
E-2242 ..... N85-21273* #
E-2303 ..... N85-22204* #
E-2320 ..... N85-21323* #
E-2344 ..... N85-21872* #
E-2359 ..... N85-21263* #
E-2361 ..... N85-21359* #
E-2362 ..... N85-21658* #
E-2399 ..... N85-21356* #
E-2406 ..... N85-21690* #
E-2419 ..... N85-21358* #
E-2430 ..... N85-21569* #
E-2435 ..... N85-21168* #
E-2440 ..... N85-21259* #
E-2448 ..... N85-22108* #
E-2459 ..... N85-21355* #
E-2462 ..... N85-21357* #
E-2463 ..... N85-21570* #
E-2464 ..... N85-21674* #
E-2465 ..... N85-21228* #
E-2466 ..... N85-21258* #
E-2473 ..... N85-21114* #
E-2475 ..... N85-21115* #
E-2478 ..... N85-21657* #
E-2479 ..... N85-21260* #
E-2484 ..... N85-21321* #
E-2485 ..... N85-21261* #
E-2490 ..... N85-21164* #
E-2493 ..... N85-21264* #
E-2495 ..... N85-21231* #
E-2502 ..... N85-21605* #
E-2513 ..... N85-21322* #
E-2518 ..... N85-21574* #

EDA/RED-84-43 ..... N85-21388 #
EDA/RED-84-44 ..... N85-21389 #

EDE-38/84 ..... N85-21664 #

EGG-ED-6725 ..... N85-21127 #

EGG-M-14484 ..... N85-22114 #
EGG-M-23484 ..... N85-21811 #
EGG-M-24784 ..... N85-21670 #

EO/MO-7 ..... N85-21483 #

EPA-450/4-84-017 ..... N85-21835 #
EPA-600/D-84-242 ..... N85-21906 #
EPA-600/D-84-252 ..... N85-21830 #
EPA-600/D-84-254 ..... N85-21829 #
EPA-600/D-84-257 ..... N85-21831 #
EPA-600/D-84-284 ..... N85-21841 #
EPA-600/D-84-300 ..... N85-21845 #
EPA-600/2-84-170 ..... N85-21833 #
EPA-600/2-84-173 ..... N85-21834 #
EPA-600/3-84-095B ..... N85-21844 #
EPA-600/3-84-113 ..... N85-21842 #
EPA-600/3-84-114 ..... N85-21843 #
EPA-600/4-84-079 ..... N85-21832 #
EPA-600/4-84-083-PT-1 ..... N85-21309 #
EPA-600/4-84-084-PT-2 ..... N85-21310 #
EPA-600/7-84-100 ..... N85-21230 #
EPA-600/8-83-026F ..... N85-21930 #
EPA-600/8-84-020A-2-VOL-2 ..... N85-21836 #
EPA-600/8-84-020A-3-VOL-3 ..... N85-21837 #
EPA-600/8-84-020A-4-VOL-4 ..... N85-21838 #

EPRI-CS-3738 ..... N85-21824 #

ERIM-160300-101-F ..... N85-21747* #

ESA-CR(P)-1944 ..... N85-21237 #

ESA-SP-207 ..... N85-22270 #

ESL-TR-84-40 ..... N85-21179 #

ESL-713533-5 ..... N85-21233* #
ESL-713774-5 ..... N85-22150 #

ETL-0362 ..... N85-21760 #

E85-10069 ..... N85-21724* #
E85-10082 ..... N85-21747* #
E85-10083 ..... N85-21748* #
E85-10084 ..... N85-21749* #
E85-10085 ..... N85-21750* #
E85-10089 ..... N85-21751* #
E85-10090 ..... N85-21752* #
E85-10091 ..... N85-21753* #
E85-10092 ..... N85-21754* #
E85-10093 ..... N85-21755* #
E85-10094 ..... N85-21756* #
E85-10095 ..... N85-21757* #

FAA-ASF-81-8 ..... N85-21982 #

FAA-MS-84-5 ..... N85-21103 #

FAA-PM-84-25 ..... N85-21881 #
FAA-PM-84-27 ..... N85-21179 #

FAA/AP-84-16 ..... N85-21139 #

FAA/CT-84-21 ..... N85-21133 #

FAA/PM-84-4 ..... N85-21136 #
FAA/PM-84-12-VOL-1 ..... N85-21180 #
FAA/PM-84-12-VOL-2 ..... N85-21181 #
FAA/PM-84-12-VOL-3 ..... N85-21182 #
FAA/PM-84-12-VOL-4 ..... N85-21183 #
FAA/PM-84-12-VOL-5 ..... N85-21184 #

FHWA/NY/RR-84/113 ..... N85-21415 #

FNAL-TM-1251 ..... N85-22102 #
FNAL-TM-1284 ..... N85-21524 #

FOA-C-20557-D8(E1) ..... N85-21983 #
FOA-C-30383-E ..... N85-21527 #
FOA-C-52006-H4-D7 ..... N85-21968 #

FOA-E-30003-A3 ..... N85-21484 #

FR-19 ..... N85-21386 #
FR-19-VOL-2 ..... N85-21384 #

FRC-RR-305 ..... N85-21124 #

GA-A-17703 ..... N85-22165 #
GA-A-17712 ..... N85-21620 #

GEPP-OP-802B ..... N85-22101 #

GNC84-027 ..... N85-21871*

GPO-31-119 ..... N85-21234 #
GPO-37-459 ..... N85-21818 #
GPO-37-784 ..... N85-22247 #
GPO-38-222 ..... N85-21132 #
GPO-38-920 ..... N85-21879 #
GPO-38-948 ..... N85-21131 #
GPO-39-478 ..... N85-22254 #
GPO-39-481 ..... N85-21243 #
GPO-39-741 ..... N85-21994 #
GPO-40-048 ..... N85-21880 #
GPO-40-678 ..... N85-21396 #
GPO-40-860 ..... N85-22245 #
GPO-41-058 ..... N85-22243 #
GPO-41-060 ..... N85-22244 #
GPO-51-006 ..... N85-22341 #
GPO-51-010 ..... N85-21225 #
GPO-51-010 ..... N85-22246 #

GRI-84/0108 ..... N85-21382 #
GRI-84/0156 ..... N85-21530 #
GRI-84/0172 ..... N85-21312 #
GRI-84/0177 ..... N85-21594 #
GRI-84/0204 ..... N85-21313 #
GRI-84/0222 ..... N85-21314 #

GT-ONR-7 ..... N85-22085 #

H-REPT-98-1189 ..... N85-22341 #

H-1248 ..... N85-21245* #

HEDL-SA-3196-FP ..... N85-21339 #

ICASE-85-3 ..... N85-22049* #
ICASE-85-4 ..... N85-22003* #
ICASE-85-5 ..... N85-22051* #
ICASE-85-12 ..... N85-22004* #
ICASE-85-13 ..... N85-21990* #
ICASE-85-15 ..... N85-22050* #
ICASE-85-19 ..... N85-21575* #

IFTR-32/1984 ..... N85-22179 #

IITRI-MO6054-47 ..... N85-21367 #

ILR-MITT-137 ..... N85-21716 #

INC-40007-24 ..... N85-22130 #

INPE-3294-PRE/609 ..... N85-21397* #

IPPJ-704 ..... N85-22158 #
IPPJ-705 ..... N85-22157 #
IPPJ-706 ..... N85-22159 #
IPPJ-707 ..... N85-22160 #
IPPJ-708 ..... N85-22172 #
IPPJ-709 ..... N85-22161 #

IR-1 ..... N85-21401 #
IR-2 ..... N85-21369 #
IR-2 ..... N85-21897 #

IS-J-1513 ..... N85-22194 #

IS-M-524 ..... N85-22196 #

ISBN-0-309-03481-7 ..... N85-21885* #
ISBN-0-947767-06-1 ..... N85-21282 #
ISBN-0-947767-118 ..... N85-21848 #
ISBN-92-835-1481-5 ..... N85-21157 #
ISBN-92-835-1483-1 ..... N85-21989 #
ISBN-951-38-2127-7 ..... N85-21682 #
ISBN-951-697-211-X ..... N85-21852 #

ISSN-0036-0911 ..... N85-22332 #
ISSN-0071-5190 ..... N85-21852 #
ISSN-0082-5255 ..... N85-21960 #
ISSN-0082-5263 ..... N85-21577 #
ISSN-0169-1708 ..... N85-21905 #
ISSN-0170-1339 ..... N85-21145 #
ISSN-0170-1339 ..... N85-21227 #
ISSN-0170-1339 ..... N85-21238 #
ISSN-0170-1339 ..... N85-21239 #
ISSN-0170-1339 ..... N85-21866 #
ISSN-0171-1342 ..... N85-21146 #
ISSN-0171-1342 ..... N85-21485 #
ISSN-0171-7618 ..... N85-21411 #
ISSN-0176-7739 ..... N85-22035 #
ISSN-0281-9937 ..... N85-21484 #
ISSN-0285-0608 ..... N85-21578 #
ISSN-0285-6808 ..... N85-21229 #
ISSN-0285-6808 ..... N85-21255 #
ISSN-0285-6808 ..... N85-21697 #
ISSN-0340-7608 ..... N85-21342 #
ISSN-0340-7608 ..... N85-21343 #
ISSN-0340-7608 ..... N85-21344 #
ISSN-0340-7608 ..... N85-21345 #
ISSN-0340-7608 ..... N85-21380 #
ISSN-0340-7608 ..... N85-21672 #
ISSN-0340-7608 ..... N85-21812 #
ISSN-0340-7608 ..... N85-21828 #
ISSN-0340-7608 ..... N85-22202 #
ISSN-0347-3694 ..... N85-21983 #
ISSN-0347-3708 ..... N85-21527 #
ISSN-0347-7665 ..... N85-21968 #
ISSN-0358-5077 ..... N85-21682 #
ISSN-0379-6566 ..... N85-22270 #
ISSN-0388-9653 ..... N85-21884 #
ISSN-0568-0581 ..... N85-21850* #

JDTI-RED-85-1 ..... N85-21163* #

JHU/APL/RC-RCS-044 ..... N85-21965 #

JPL-PUB-83-62 ..... N85-21849* #

JPRS-CST-85-008 ..... N85-21416 #

JPRS-UEE-85-004 ..... N85-21531 #

JPRS-USB-85-002 ..... N85-21931 #

JPRS-UTR-85-004 ..... N85-21105 #

JSC-20236 ..... N85-21750* #
JSC-20237 ..... N85-21748* #
JSC-20238 ..... N85-21749* #
JSC-20239 ..... N85-21751* #

KAPL-4181 ..... N85-21337 #

KHR-8 ..... N85-22330* #

KNMI-TR-58 ..... N85-21905 #

KU-SFB-210/ET/3 ..... N85-21648 #

L-15804 ..... N85-21116* #
L-15861 ..... N85-22109* #
L-15879 ..... N85-21120* #

LA-UR-84-2651 ..... N85-22134 #
LA-UR-84-2799 ..... N85-22113 #
LA-UR-84-3097 ..... N85-21861 #
LA-UR-84-3209 ..... N85-21589 #
LA-UR-84-3428 ..... N85-22047 #
LA-UR-84-3447 ..... N85-21962 #
LA-UR-84-3486 ..... N85-22195 #
LA-UR-84-3522 ..... N85-22072 #
LA-UR-84-3634 ..... N85-21629 #
LA-UR-84-3762 ..... N85-21863 #

LA-9667-MS ..... N85-21576 #
LA-9680-SR ..... N85-22131 #
LA-9917-MS ..... N85-22052 #
LA-9938-MS ..... N85-22011 #
LA-9969-MS ..... N85-22007 #
LA-9978-MS ..... N85-22006 #

LA-9998-MS ..... N85-21638 #
LA-10032-PR ..... N85-22138 #
LA-10048-MS ..... N85-21440 #
LA-10049-M ..... N85-22009 #
LA-10092-T ..... N85-22008 #
LA-10104-M ..... N85-22018 #
LA-10141-MS ..... N85-22010 #
LA-10142-MS ..... N85-22012 #
LA-10144-MS ..... N85-22013 #
LA-10145-MS ..... N85-22015 #
LA-10146-MS ..... N85-22014 #
LA-10164-MS ..... N85-21376 #
LA-10172-MS ..... N85-21402 #
LA-10173-MS ..... N85-21403 #
LA-10206-M ..... N85-22030 #
LA-10217-SR ..... N85-22128 #
LA-10232-SR ..... N85-22129 #
LA-10258-M ..... N85-22125 #

LALP-84-51 ..... N85-21903 #

LBL-17687 ..... N85-21305 #
LBL-17714 ..... N85-22118 #
LBL-18016 ..... N85-22167 #
LBL-18047 ..... N85-21619 #
LBL-18191 ..... N85-21622 #
LBL-18214 ..... N85-22190 #
LBL-18267 ..... N85-21519 #
LBL-18288 ..... N85-21518 #
LBL-18414 ..... N85-21525 #
LBL-18469 ..... N85-21590 #
LBL-18504 ..... N85-22259 #
LBL-18574 ..... N85-21523 #
LBL-18634 ..... N85-22071 #

LC-79-640375 ..... N85-22332 #
LC-79-640375-VOL-1 ..... N85-22335 #
LC-84-61498 ..... N85-21865* #
LC-84-600163 ..... N85-21346 #
LC-84-601096 ..... N85-21717 #
LC-84-601106 ..... N85-21381 #
LC-84-601107 ..... N85-21311 #
LC-84-601109 ..... N85-22264 #
LC-84-601119 ..... N85-22040 #
LC-84-601120 ..... N85-22039 #
LC-84-601131 ..... N85-22208 #

LIDS-P-1425 ..... N85-22068 #

LIDS-TH-1424 ..... N85-22251 #

LISS-8 ..... N85-22110 #
LISS-10 ..... N85-22055 #

LMSC/D981899-D145 ..... N85-21240* #

LR-615 ..... N85-21121 #

MATHEMATICS-RESEARCH-161 ..... N85-22079 #
MATHEMATICS-RESEARCH-162 ..... N85-22078 #
MATHEMATICS-RESEARCH-165 ..... N85-22053 #
MATHEMATICS-RESEARCH-166 ..... N85-22077 #
MATHEMATICS-RESEARCH-169 ..... N85-22061 #
MATHEMATICS-RESEARCH-171 ..... N85-22054 #
MATHEMATICS-RESEARCH-172 ..... N85-22060 #

MATRA-DM.51/CC/FL/0151.83 ..... N85-21237 #

MIMEO-SER-1545 ..... N85-22056 #
MIMEO-SER-1562 ..... N85-21677 #

MLM-3192(OP) ..... N85-21336 #
MLM-3214(OP) ..... N85-22205 #

MRC-TSR-2747 ..... N85-22057 #
MRC-TSR-2749 ..... N85-22092 #
MRC-TSR-2768 ..... N85-22058 #

MRL-R-858 ..... N85-21388 #
MRL-R-933 ..... N85-21644 #
MRL-R-947 ..... N85-22182 #

MSC-TN-10 ..... N85-21884 #

MSNW-C-13-259-01 ..... N85-21772 #

N-0208-5658 ..... N85-22174 #

NADC-84076-60 ..... N85-21158 #
NADC-84170-60 ..... N85-21365 #

NAE-AN-23 ..... N85-21125 #
NAE-AN-24 ..... N85-21153 #

NAEC-92-181 ..... N85-21155 #

NAF-AN-25 ..... N85-21696 #

NAS 1.15:58264 ..... N85-21262* #
NAS 1.15:77493 ..... N85-21660* #
NAS 1.15:77536 ..... N85-22324* #
NAS 1.15:77613 ..... N85-22209* #
NAS 1.15:77615 ..... N85-21228* #
NAS 1.15:77645 ..... N85-21244* #
NAS 1.15:77803 ..... N85-21169* #
NAS 1.15:77809 ..... N85-21408* #
NAS 1.15:77810 ..... N85-21110* #
NAS 1.15:77812 ..... N85-21111* #
NAS 1.15:77816 ..... N85-21611* #
NAS 1.15:80599 ..... N85-21609* #
NAS 1.15:83590 ..... N85-21162* #
NAS 1.15:83693 ..... N85-22255* #
NAS 1.15:83754 ..... N85-21273* #
NAS 1.15:83800 ..... N85-22204* #
NAS 1.15:85231 ..... N85-22340* #
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NAS 1.15:87435 ..... N85-22339* #
NAS 1.15:87458 ..... N85-22338*
NAS 1.15:88690 ..... N85-21112* #
NAS 1.15:175512 ..... N85-21661* #
NAS 1.19:211 ..... N85-21251* #
NAS 1.21:475 ..... N85-22323* #
NAS 1.21:7011(267) N85-21959*
NAS 1.26:3666 ..... N85-21166* #
NAS 1.26:3669 ..... N85-21167* #
NAS 1.26:3671 ..... N85-21271* #
NAS 1.26:3674 ..... N85-21675* #
NAS 1.26:3676 ..... N85-21117* #
NAS 1.26:3682 ..... N85-21119* #
NAS 1.26:3684 ..... N85-21272* #
NAS 1.26:171317 ..... N85-22210* #
NAS 1.26:171355 ..... N85-21673* #
NAS 1.26:171382 ..... N85-21166* #
NAS 1.26:171418 ..... N85-21676* #
NAS 1.26:171846 ..... N85-21923* #
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NAS 1.26:172567 ..... N85-22002* #
NAS 1.26:172589 ..... N85-21991* #
NAS 1.26:174700 ..... N85-21686* #
NAS 1.26:174812 ..... N85-21163* #
NAS 1.26:174816 ..... N85-21662* #
NAS 1.26:174836 ..... N85-21691* #
NAS 1.26:174839 ..... N85-21604* #
NAS 1.26:174841 ..... N85-21320* #
NAS 1.26:174872 ..... N85-21685* #
NAS 1.26:175157 ..... N85-21884* #
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NAS 1.26:175285 ..... N85-21430* #
NAS 1.26:175286 ..... N85-22044* #
NAS 1.26:175472 ..... N85-22337* #
NAS 1.26:175483 ..... N85-21414* #
NAS 1.26:175490 ..... N85-22331* #
NAS 1.26:175495 ..... N85-22330* #
NAS 1.26:175496 ..... N85-21571* #
NAS 1.26:175504 ..... N85-22001* #
NAS 1.26:175505 ..... N85-22266* #
NAS 1.26:175506 ..... N85-21847* #
NAS 1.26:175507 ..... N85-21439* #
NAS 1.26:175510 ..... N85-21851* #
NAS 1.26:175511 ..... N85-22326* #
NAS 1.26:175513 ..... N85-21850* #
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NAS 1.26:175541 ..... N85-21607 #
NAS 1.26:175542 ..... N85-22333* #
NAS 1.26:175543 ..... N85-21910* #
NAS 1.26:175544 ..... N85-22334* #
NAS 1.26:175545 ..... N85-21865* #
NAS 1.26:175550 ..... N85-21269* #
NAS 1.26:175552 ..... N85-21233* #
NAS 1.26:175553 ..... N85-21926* #
NAS 1.26:175554 ..... N85-22327* #
NAS 1.26:175557 ..... N85-22267* #
NAS 1.26:175558 ..... N85-22256* #
NAS 1.26:175564 ..... N85-21849* #
NAS 1.26:175565 ..... N85-21242* #
NAS 1.26:175566 ..... N85-21693* #
NAS 1.26:175567 ..... N85-21694* #
NAS 1.26:175570 ..... N85-21758* #
NAS 1.26:175572 ..... N85-22269* #
NAS 1.26:175573 ..... N85-21165* #
NAS 1.26:175574 ..... N85-21687* #
NAS 1.26:175576 ..... N85-22268* #
NAS 1.26:175584 ..... N85-21985* #
NAS 1.26:175585 ..... N85-21250* #
NAS 1.26:175586 ..... N85-21263* #
NAS 1.26:175587 ..... N85-22328* #
NAS 1.26:175588 ..... N85-21692* #
NAS 1.26:175609 ..... N85-21720* #
NAS 1.55:2355-VOL-3-PT-2 ..... N85-21724* #
NAS 1.55:2360 ..... N85-21188* #
NAS 1.55:2366 ..... N85-21659* #
NAS 1.60:2396 ..... N85-22109* #
NAS 1.60:2413 ..... N85-21120* #
NAS 1.60:2417 ..... N85-21118* #
NAS 1.60:2435 ..... N85-21168* #
NAS 1.60:2437 ..... N85-21263* #
NAS 1.60:2438 ..... N85-21246* #
NAS 1.60:2443 ..... N85-21323* #
NAS 1.60:2448 ..... N85-21878* #
NAS 1.60:2449 ..... N85-21359* #
NAS 1.71:ARC-11368-2 ..... N85-21347*
NAS 1.71:ARC-11424-1 ..... N85-21361* #
NAS 1.71:ARC-11512-2 ..... N85-21362* #
NAS 1.71:ARC-11522-2 ..... N85-21363* #
NAS 1.71:ARC-11533-1 ..... N85-21364* #
NAS 1.71:ARC-11543-1 ..... N85-21986* #
NAS 1.71:ARC-11616-1 ..... N85-21987* #
NAS 1.71:GSC-12558-1 ..... N85-21639*
NAS 1.71:GSC-12799-1 ..... N85-21404*
NAS 1.71:GSC-12808-1 ..... N85-21279*
NAS 1.71:LAR-12568-1 ..... N85-21568*
NAS 1.71:LAR-12775-2 ..... N85-21349*
NAS 1.71:LAR-12868-1 ..... N85-21651*
NAS 1.71:LAR-12979-1 ..... N85-21147*
NAS 1.71:LAR-13014-1 ..... N85-21178*
NAS 1.71:LAR-13294-1 ..... N85-21610* #
NAS 1.71:LAR-13310-1 ..... N85-21441* #
NAS 1.71:LAR-13351-1 ..... N85-21360* #
NAS 1.71:LEW-13324-2 ..... N85-21266*
NAS 1.71:LEW-13770-3 ..... N85-21350*
NAS 1.71:LEW-13770-4 ..... N85-21351*
NAS 1.71:LEW-13770-5 ..... N85-21352*
NAS 1.71:LEW-13827-1 ..... N85-21768*
NAS 1.71:LEW-13833-1 ..... N85-21492*
NAS 1.71:LEW-13837-2 ..... N85-21267*
NAS 1.71:LEW-13881-1 ..... N85-21256*
NAS 1.71:LEW-14104-1 ..... N85-21324* #
NAS 1.71:MFS-25637-1 ..... N85-21769*
NAS 1.71:MFS-25721-1 ..... N85-21260*
NAS 1.71:MSC-18578-1 ..... N85-21427*
NAS 1.71:MSC-20275-1 ..... N85-21595*
NAS 1.71:MSC-20319-1 ..... N85-21649*
NAS 1.71:NPO-15155-1 ..... N85-22139*
NAS 1.71:NPO-15295-1 ..... N85-21992*
NAS 1.71:NPO-15430-1 ..... N85-21846*
NAS 1.71:NPO-15433-1 ..... N85-21428*
NAS 1.71:NPO-15466-1 ..... N85-22104*
NAS 1.71:NPO-15483-1 ..... N85-21650*
NAS 1.71:NPO-15560-1 ..... N85-21491*
NAS 1.71:NPO-15651-1 ..... N85-21723*
NAS 1.71:NPO-15759-1 ..... N85-21596*
NAS 1.71:NPO-15790-1 ..... N85-21631*
NAS 1.71:NPO-15800-2 ..... N85-22178* #
NAS 1.71:NPO-15851-1 ..... N85-21652*
NAS 1.71:NPO-15920-1 ..... N85-21493*
NAS 1.71:NPO-16022-1 ..... N85-22105*
NAS 1.71:NPO-16027-1 ..... N85-21597*
NAS 1.71:NPO-16336-1-CU ..... N85-21407* #
NAS 1.71:NPO-16413-1 ..... N85-21325* #
NAS 1.71:WLP-10055-2 ..... N85-21596*
NASA-CASE-ARC-11368-2 ..... N85-21347*
NASA-CASE-ARC-11413-1 ..... N85-21348*
NASA-CASE-ARC-11424-1 ..... N85-21361* #
NASA-CASE-ARC-11512-2 ..... N85-21362* #
NASA-CASE-ARC-11522-2 ..... N85-21363* #
NASA-CASE-ARC-11533-1 ..... N85-21364* #
NASA-CASE-ARC-11543-1 ..... N85-21986* #
NASA-CASE-ARC-11616-1 ..... N85-21987* #
NASA-CASE-GSC-12558-1 ..... N85-21639*
NASA-CASE-GSC-12799-1 ..... N85-21404*
NASA-CASE-GSC-12808-1 ..... N85-21279*
NASA-CASE-LAR-12568-1 ..... N85-21568*
NASA-CASE-LAR-12775-2 ..... N85-21349*
NASA-CASE-LAR-12868-1 ..... N85-21651*
NASA-CASE-LAR-12979-1 ..... N85-21147*
NASA-CASE-LAR-13014-1 ..... N85-21178*
NASA-CASE-LAR-13294-1 ..... N85-21610* #
NASA-CASE-LAR-13310-1 ..... N85-21441* #
NASA-CASE-LAR-13351-1 ..... N85-21360* #
NASA-CASE-LEW-13324-2 ..... N85-21266*
NASA-CASE-LEW-13770-3 ..... N85-21350*
NASA-CASE-LEW-13770-4 ..... N85-21351*
NASA-CASE-LEW-13770-5 ..... N85-21352*
NASA-CASE-LEW-13827-1 ..... N85-21768*
NASA-CASE-LEW-13833-1 ..... N85-21492*
NASA-CASE-LEW-13837-2 ..... N85-21267*
NASA-CASE-LEW-13881-1 ..... N85-21256*
NASA-CASE-LEW-14104-1 ..... N85-21324* #
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NASA-CASE-MFS-25721-1 ..... N85-21260*
NASA-CASE-MSC-18578-1 ..... N85-21427*
NASA-CASE-MSC-20275-1 ..... N85-21595*
NASA-CASE-MSC-20319-1 ..... N85-21649*
NASA-CASE-NPO-15155-1 ..... N85-22139*
NASA-CASE-NPO-15295-1 ..... N85-21992*
NASA-CASE-NPO-15430-1 ..... N85-21846*
NASA-CASE-NPO-15433-1 ..... N85-21428*
NASA-CASE-NPO-15466-1 ..... N85-22104*
NASA-CASE-NPO-15483-1 ..... N85-21650*
NASA-CASE-NPO-15560-1 ..... N85-21491*
NASA-CASE-NPO-15651-1 ..... N85-21723*
NASA-CASE-NPO-15759-1 ..... N85-21596*
NASA-CASE-NPO-15790-1 ..... N85-21631*
NASA-CASE-NPO-15800-2 ..... N85-22178* #
NASA-CASE-NPO-15851-1 ..... N85-21652*
NASA-CASE-NPO-15920-1 ..... N85-21493*
NASA-CASE-NPO-16022-1 ..... N85-22105*
NASA-CASE-NPO-16027-1 ..... N85-21597*
NASA-CASE-NPO-16336-1-CU ..... N85-21407* #
NASA-CASE-NPO-16413-1 ..... N85-21325* #
NASA-CASE-WLP-10055-2 ..... N85-21596*
NASA-CP-2355-VOL-3-PT-2 ..... N85-21724* #
NASA-CP-2360 ..... N85-21188* #
NASA-CP-2366 ..... N85-21659* #

NASA-CR-3866 ..... N85-21166* #
NASA-CR-3869 ..... N85-21167* #
NASA-CR-3871 ..... N85-21271* #
NASA-CR-3874 ..... N85-21675* #
NASA-CR-3878 ..... N85-21117* #
NASA-CR-3882 ..... N85-21119* #
NASA-CR-3884 ..... N85-21272* #
NASA-CR-171317 ..... N85-22210* #
NASA-CR-171355 ..... N85-21873* #
NASA-CR-171382 ..... N85-21186* #
NASA-CR-171418 ..... N85-21876* #
NASA-CR-171846 ..... N85-21923* #
NASA-CR-171853 ..... N85-21924* #
NASA-CR-171857 ..... N85-21747* #
NASA-CR-172489 ..... N85-21173* #
NASA-CR-172506 ..... N85-21176* #
NASA-CR-172523 ..... N85-21606* #
NASA-CR-172526 ..... N85-21150* #
NASA-CR-172535 ..... N85-22049* #
NASA-CR-172541 ..... N85-22003* #
NASA-CR-172544 ..... N85-22004* #
NASA-CR-172552 ..... N85-22050* #
NASA-CR-172556 ..... N85-22051* #
NASA-CR-172557 ..... N85-21990* #
NASA-CR-172561 ..... N85-21575* #
NASA-CR-172567 ..... N85-22002* #
NASA-CR-172569 ..... N85-21991* #
NASA-CR-174700 ..... N85-21686* #
NASA-CR-174812 ..... N85-21163* #
NASA-CR-174816 ..... N85-21662* #
NASA-CR-174836 ..... N85-21691* #
NASA-CR-174839 ..... N85-21604* #
NASA-CR-174841 ..... N85-21320* #
NASA-CR-174872 ..... N85-21685* #
NASA-CR-175157 ..... N85-21894* #
NASA-CR-175284 ..... N85-21759* #
NASA-CR-175285 ..... N85-21439* #
NASA-CR-175286 ..... N85-22044* #
NASA-CR-175472 ..... N85-22337* #
NASA-CR-175483 ..... N85-21414* #
NASA-CR-175490 ..... N85-22331* #
NASA-CR-175495 ..... N85-22330* #
NASA-CR-175496 ..... N85-21571* #
NASA-CR-175504 ..... N85-22001* #
NASA-CR-175505 ..... N85-22266* #
NASA-CR-175506 ..... N85-21847* #
NASA-CR-175507 ..... N85-21438* #
NASA-CR-175510 ..... N85-21851* #
NASA-CR-175511 ..... N85-22326* #
NASA-CR-175512 ..... N85-21661* #
NASA-CR-175513 ..... N85-21850* #
NASA-CR-175514 ..... N85-21240* #
NASA-CR-175515 ..... N85-21268* #
NASA-CR-175518 ..... N85-21748* #
NASA-CR-175520 ..... N85-21750* #
NASA-CR-175524 ..... N85-21751* #
NASA-CR-175525 ..... N85-21752* #
NASA-CR-175526 ..... N85-21753* #
NASA-CR-175527 ..... N85-21754* #
NASA-CR-175528 ..... N85-21755* #
NASA-CR-175529 ..... N85-21749* #
NASA-CR-175529 ..... N85-21756* #
NASA-CR-175530 ..... N85-21757* #
NASA-CR-175535 ..... N85-21397* #
NASA-CR-175541 ..... N85-21607 #
NASA-CR-175542 ..... N85-22333* #
NASA-CR-175543 ..... N85-21910* #
NASA-CR-175544 ..... N85-22334* #
NASA-CR-175545 ..... N85-21665* #
NASA-CR-175550 ..... N85-21269* #
NASA-CR-175552 ..... N85-21233* #
NASA-CR-175553 ..... N85-21926* #
NASA-CR-175554 ..... N85-22327* #
NASA-CR-175557 ..... N85-22267* #
NASA-CR-175558 ..... N85-22256* #
NASA-CR-175564 ..... N85-21849* #
NASA-CR-175565 ..... N85-21242* #
NASA-CR-175566 ..... N85-21693* #
NASA-CR-175567 ..... N85-21694* #
NASA-CR-175570 ..... N85-21758* #
NASA-CR-175572 ..... N85-22269* #
NASA-CR-175573 ..... N85-21165* #
NASA-CR-175574 ..... N85-21687* #
NASA-CR-175576 ..... N85-22268* #
NASA-CR-175584 ..... N85-21985* #
NASA-CR-175585 ..... N85-21250* #
NASA-CR-175588 ..... N85-21283* #
NASA-CR-175587 ..... N85-22328* #
NASA-CR-175588 ..... N85-21692* #
NASA-CR-175609 ..... N85-21720* #

NASA-EP-211 ..... N85-21251* #

NASA-SP-475 ..... N85-22323* #
NASA-SP-7011(267) N85-21959*

NASA-TM-58264 ..... N85-21282* #
NASA-TM-77493 ..... N85-21660* #
NASA-TM-77536 ..... N85-22324* #
NASA-TM-77613 ..... N85-22209* #
NASA-TM-77615 ..... N85-21226* #
NASA-TM-77645 ..... N85-21244* #
NASA-TM-77803 ..... N85-21169* #
NASA-TM-77809 ..... N85-21406* #
NASA-TM-77810 ..... N85-21110* #
NASA-TM-77812 ..... N85-21111* #
NASA-TM-77816 ..... N85-21611* #
NASA-TM-80599 ..... N85-21609* #
NASA-TM-83590 ..... N85-21162* #
NASA-TM-83693 ..... N85-22255* #
NASA-TM-83754 ..... N85-21273* #
NASA-TM-83800 ..... N85-22204* #
NASA-TM-85231 ..... N85-22340* #
NASA-TM-85820 ..... N85-21573* #
NASA-TM-85827 ..... N85-21695* #
NASA-TM-85864 ..... N85-21149* #
NASA-TM-85904 ..... N85-21245* #
NASA-TM-86183 ..... N85-21871*
NASA-TM-86347 ..... N85-21877* #
NASA-TM-86355 ..... N85-21270* #
NASA-TM-86376 ..... N85-21116* #
NASA-TM-86379 ..... N85-21874* #
NASA-TM-86380 ..... N85-21689* #
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NASA-TM-86495 ..... N85-21249* #
NASA-TM-86496 ..... N85-21248* #
NASA-TM-86497 ..... N85-21875* #
NASA-TM-86498 ..... N85-21232* #
NASA-TM-86658 ..... N85-21113* #
NASA-TM-86690 ..... N85-21112* #
NASA-TM-86691 ..... N85-21572* #
NASA-TM-86692 ..... N85-21925* #
NASA-TM-86696 ..... N85-21174* #
NASA-TM-86883 ..... N85-21872* #
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NASA-TM-86926 ..... N85-21569* #
NASA-TM-86935 ..... N85-22108* #
NASA-TM-86944 ..... N85-21570* #
NASA-TM-86945 ..... N85-21674* #
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NASA-TM-86956 ..... N85-21260* #
NASA-TM-86958 ..... N85-21658* #
NASA-TM-86959 ..... N85-21321* #
NASA-TM-86960 ..... N85-21261* #
NASA-TM-86962 ..... N85-21355* #
NASA-TM-86963 ..... N85-21164* #
NASA-TM-86964 ..... N85-21357* #
NASA-TM-86965 ..... N85-21657* #
NASA-TM-86968 ..... N85-21264* #
NASA-TM-86969 ..... N85-21231* #
NASA-TM-86973 ..... N85-21605* #
NASA-TM-86974 ..... N85-21356* #
NASA-TM-86976 ..... N85-21322* #
NASA-TM-86977 ..... N85-21358* #
NASA-TM-86980 ..... N85-21574* #
NASA-TM-87428 ..... N85-21135* #
NASA-TM-87435 ..... N85-22339* #
NASA-TM-87458 ..... N85-22338*

NASA-TP-2398 ..... N85-22109* #
NASA-TP-2413 ..... N85-21120* #
NASA-TP-2417 ..... N85-21118* #
NASA-TP-2435 ..... N85-21166* #
NASA-TP-2437 ..... N85-21263* #
NASA-TP-2438 ..... N85-21246* #
NASA-TP-2443 ..... N85-21323* #
NASA-TP-2448 ..... N85-21878* #
NASA-TP-2449 ..... N85-21359* #

NBS-TN-1196 ..... N85-21801 #

NBS/BSS-162 ..... N85-21717 #

NBS/GCR-84/470/1 ..... N85-21383 #
NBS/GCR-84/470/2 ..... N85-21384 #
NBS/GCR-84/470/4-VOL-4 ..... N85-21385 #
NBS/GCR-84/470/5-VOL-5 ..... N85-21386 #
NBS/GCR-84/470/6-VOL-6 ..... N85-21387 #

NBS/SP-260/89 ..... N85-21381 #
NBS/SP-260/90 ..... N85-21311 #
NBS/SP-500/117/1-VOL-1 ..... N85-22040 #
NBS/SP-500/117/2-VOL-2 ..... N85-22039 #
NBS/SP-685 ..... N85-22208 #

NBSIR-84-2909 ..... N85-21813 #
NBSIR-84-2942 ..... N85-21809 #

NBSIR-84-2942 ..... N85-21816 #
NBSIR-84-2949 ..... N85-21807 #
NBSIR-84-2972 ..... N85-21810 #
NBSIR-84-2972 ..... N85-21815 #
NBSIR-84-3014 ..... N85-21486 #
NBSIR-84-3015 ..... N85-22265 #

NCEL-TN-1710 ..... N85-21702 #

NEPRF-CR-84-08 ..... N85-21805 #

NEPRF-TR-83-01 ..... N85-21900 #

NLM/MED-84/04 ..... N85-22261 #
NLM/MED-84/05 ..... N85-22262 #

NLR-MP-84003-U ..... N85-21593 #
NLR-MP-84022-U ..... N85-21130 #

NLR-TR-82069-U-PT-2 ..... N85-21579 #
NLR-TR-82116-U-PT-2 ..... N85-21254 #

NMAB-418 ..... N85-21389 #

NOAA-DR-ERL-SEL-4 ..... N85-21868 #

NOAA-NWS-ERCP-25 ..... N85-21908 #
NOAA-NWS-ERCP-26 ..... N85-21909 #
NOAA-NWS-ERCP-27 ..... N85-21911 #

NOAA-NWS-TDL-CP-84-2 ..... N85-21913 #

NOAA-TM-ERL-AOML-57 ..... N85-21765 #

NOAA-TM-ERL-ARL-129 ..... N85-22334* #
NOAA-TM-ERL-ARL-130 ..... N85-21839 #

NOAA-TM-ERL-ESG-7 ..... N85-21910* #

NOAA-TM-NMFS-F/NWC-64 ..... N85-21840 #

NOAA-TM-NOS-NGS-40 ..... N85-21767 #
NOAA-TM-NOS-NGS-41 ..... N85-21766 #

NOAA-TM-NWS-WR-184 ..... N85-21907 #

NOAA-TR-NESDIS-10 ..... N85-21870 #

NOAA/NWS-TDL-CP-84-3 ..... N85-21912 #

NPRDC-TL-85-3 ..... N85-22022 #

NPS52-84-022 ..... N85-22043 #
NPS52-84-026 ..... N85-22020 #
NPS53-85-0005 ..... N85-21705 #
NPS68-84-019 ..... N85-21919 #

NR-27 ..... N85-21882 #

NRC-23941 ..... N85-21125 #
NRC-23959 ..... N85-21121 #
NRC-24089 ..... N85-21153 #
NRC-24131 ..... N85-21606 #

NRL-MR-4843 ..... N85-22024 #
NRL-MR-5324 ..... N85-22163 #
NRL-MR-5432 ..... N85-21643 #
NRL-MR-5445 ..... N85-21642 #
NRL-MR-5479 ..... N85-21614 #
NRL-MR-5499 ..... N85-21645 #
NRL-MR-5502-REV ..... N85-22024 #
NRL-MR-5512 ..... N85-21330 #

NSF/ECS-84001 ..... N85-21526 #

NSF/MEA-84008 ..... N85-22041 #

NSF/OIR-84004 ..... N85-22155 #

NSMRL-MEMO-84-4 ..... N85-21988 #

NSWC/TR-84-150 ..... N85-21370 #

NTIA/REPT-84-151 ..... N85-21487 #
NTIA/REPT-84-153 ..... N85-21486 #
NTIA/REPT-84-154 ..... N85-21489 #

NTSB/ARC-85/01 ..... N85-21134 #

OEHL-85-028CV111ARA ..... N85-21471 #
OEHL-85-029CV111ARA ..... N85-21962 #

OIT/FSTC-84/215 ..... N85-22037 #
OIT/FSTC-84/216 ..... N85-22036 #

ONERA-1983-91 ..... N85-21684

ONR-252-008-3 ..... N85-21475 #

ONRL-R-13-84 ..... N85-22258 #

ORNL-ESD-2434 ..... N85-22136 #

ORNL-SUB-79-21453-19 ..... N85-21522 #

ORNL-6095 ..... N85-22121 #

ORNL/SUB-83-51926/1 ..... N85-21304 #

ORNL/TM-9115 ..... N85-21409 #
ORNL/TM-9219 ..... N85-22164 #
ORNL/TM-9403 ..... N85-21966 #

OSURF-TR-2 ..... N85-21328 #

OTA-ISC-173 ..... N85-22264 #

PB84-173269 ..... N85-22253 #
PB84-216092 ..... N85-22261 #
PB84-216100 ..... N85-22262 #
PB85-106391 ..... N85-21717 #
PB85-106744 ..... N85-21906 #
PB85-107993 ..... N85-22037 #
PB85-108009 ..... N85-22038 #
PB85-108512 ..... N85-21867 #
PB85-108843 ..... N85-21412 #
PB85-109072 ..... N85-21868 #
PB85-109759 ..... N85-22155 #
PB85-110534 ..... N85-21907 #
PB85-110666 ..... N85-21487 #
PB85-110799 ..... N85-21765 #
PB85-110831 ..... N85-21526 #
PB85-111037 ..... N85-21489 #
PB85-111201 ..... N85-21813 #
PB85-112076 ..... N85-22332 #
PB85-112086 ..... N85-21381 #
PB85-112695 ..... N85-21486 #
PB85-112[illegible]77 ..... N85-21908 #
PB85-113062 ..... N85-21383 #
PB85-113090 ..... N85-21384 #
PB85-113116 ..... N85-21385 #
PB85-113124 ..... N85-21386 #
PB85-113132 ..... N85-21387 #
PB85-115426 ..... N85-22103 #
PB85-115772 ..... N85-22333* #
PB85-115814 ..... N85-21311 #
PB85-116051 ..... N85-21309 #
PB85-116069 ..... N85-21310 #
PB85-116077 ..... N85-21829 #
PB85-116101 ..... N85-21830 #
PB85-116176 ..... N85-21831 #
PB85-116184 ..... N85-21832 #
PB85-116382 ..... N85-21870 #
PB85-116508 ..... N85-21346 #
PB85-116523 ..... N85-21718 #
PB85-116853 ..... N85-21833 #
PB85-117059 ..... N85-21834 #
PB85-117984 ..... N85-21869 #
PB85-118511 ..... N85-21382 #
PB85-119485 ..... N85-21835 #
PB85-120384 ..... N85-21909 #
PB85-120848 ..... N85-21930 #
PB85-121697 ..... N85-21490 #
PB85-122000 ..... N85-22039 #
PB85-122018 ..... N85-22040 #
PB85-124097 ..... N85-21814 #
PB85-124956 ..... N85-21368 #
PB85-125029 ..... N85-21389 #
PB85-125524 ..... N85-21865* #
PB85-126043 ..... N85-21836 #
PB85-126050 ..... N85-21837 #
PB85-126068 ..... N85-21838 #
PB85-126282 ..... N85-21840 #
PB85-127157 ..... N85-22260 #
PB85-127173 ..... N85-21720* #
PB85-127181 ..... N85-21719 #
PB85-127744 ..... N85-22264 #
PB85-128106 ..... N85-22252 #
PB85-128148 ..... N85-22265 #
PB85-128353 ..... N85-21910* #
PB85-128429 ..... N85-21414* #
PB85-128452 ..... N85-22334* #
PB85-128460 ..... N85-21839 #
PB85-129641 ..... N85-21767 #
PB85-132322 ..... N85-21607 #
PB85-132884 ..... N85-21529 #
PB85-133452 ..... N85-22263 #
PB85-133775 ..... N85-21766 #
PB85-134492 ..... N85-22041 #
PB85-135002 ..... N85-21911 #
PB85-135051 ..... N85-21922 #
PB85-136414 ..... N85-22042 #
PB85-136885 ..... N85-21415 #

PB85-137339 ..... N85-21841 #
PB85-137370 ..... N85-21844 #
PB85-137578 ..... N85-21912 #
PB85-137586 ..... N85-21913 #
PB85-137693 ..... N85-22208 #
PB85-138279 ..... N85-21843 #
PB85-138626 ..... N85-21842 #
PB85-144145 ..... N85-21845 #
PB85-144350 ..... N85-21914 #
PB85-146868 ..... N85-21815 #
PB85-146876 ..... N85-21816 #
PB85-147692 ..... N85-22335 #
PB85-147700 ..... N85-22336 #
PB85-148468 ..... N85-21594 #
PB85-148799 ..... N85-21915 #
PB85-149698 ..... N85-21313 #
PB85-149706 ..... N85-21314 #
PB85-149763 ..... N85-21530 #
PB85-149789 ..... N85-21312 #
PB85-1143270 ..... N85-21488 #

PCN902-91548 ..... N85-21757* #

PHL-1984-62 ..... N85-21171 #

PML-1984-37 ..... N85-21308 #

PNL-SA-12207 ..... N85-21630 #
PNL-SA-12667 ..... N85-21712 #

PNL-5152-PT-32SER-3 ..... N85-21826 #
PNL-5183 ..... N85-21185 #
PNL-5261 ..... N85-21617 #
PNL-5283 ..... N85-21902 #

PR-19 ..... N85-21383 #

PRG-R-98 ..... N85-21854 #

PWA-5940-19 ..... N85-21686* #

QPR-1 ..... N85-22331* #

QR-9 ..... N85-21756* #
QR-10 ..... N85-21755* #
QR-19 ..... N85-21522 #

R-84-SRD-050 ..... N85-21313 #
R-464 ..... N85-21718 #
R-6679 ..... N85-21504 #

RAD-84-203-001-80-21 ..... N85-21230 #

RADC-TR-84-73-VOL-1 ..... N85-22145 #
RADC-TR-84-73-VOL-2 ..... N85-21996 #
RADC-TR-84-115 ..... N85-21515 #
RADC-TR-84-150 ..... N85-21995 #
RADC-TR-84-165 ..... N85-21507 #
RADC-TR-84-178 ..... N85-21479 #
RADC-TR-84-180 ..... N85-21509 #
RADC-TR-84-181 ..... N85-21508 #
RADC-TR-84-186 ..... N85-21253 #
RADC-TR-84-204 ..... N85-22151 #
RADC-TR-84-218 ..... N85-21478 #
RADC-TR-84-242 ..... N85-21859 #

RAE-LIBRARY BIB-383 ..... N85-22257 #

RAND/N-2152-ARPA ..... N85-22023 #
RAND/N-2164-AF ..... N85-21474 #

RE-688 ..... N85-21123 #

REPT-4 ..... N85-21860 #
REPT-19-VOL-4 ..... N85-21385 #
REPT-20-219-6340-5 ..... N85-21274 #
REPT-20-219-6340-5 ..... N85-21276 #
REPT-32 ..... N85-21369 #
REPT-37 ..... N85-21883 #
REPT-83-6F4-FACTR-R1 ..... N85-21515 #
REPT-84-SM-13 ..... N85-21709 #
REPT-84-9C9-TUDEV-R1 ..... N85-22185 #
REPT-84SDS4255 ..... N85-21439* #
REPT-85B0115-VOL-3-PT-2 ..... N85-21724* #
REPT-613 ..... N85-21578 #
REPT-614 ..... N85-21697 #
REPT-615 ..... N85-21229 #
REPT-616 ..... N85-21255 #
REPT-85075 ..... N85-21113* #
REPT-85147 ..... N85-21112* #

RFP-3628 ..... N85-21410 #

RHIC-TN-5 ..... N85-22124 #

RHIC-2 ..... N85-22192 #

RSRE-MEMO-3724 ..... N85-21137 #

S-EXEC-REPT-98-52 ..... N85-21234 #

S-HRG-98-986 ..... N85-22247 #

S-REPT-98-656 ..... N85-21225 #
S-REPT-98-664 ..... N85-22246 #

S-532 ..... N85-21188* #
S-542 ..... N85-21262* #
S-543 ..... N85-21675* #

SAIC-84/1320 ..... N85-21899 #
SAIC-84/1424 ..... N85-22111 #
SAIC-84/1634 ..... N85-21480 #

SAND-83-1361 ..... N85-21803 #
SAND-84-0713 ..... N85-21278 #
SAND-84-0985C ..... N85-21618 #
SAND-84-1015C ..... N85-21921 #
SAND-84-1062 ..... N85-21128 #
SAND-84-1293C ..... N85-22200 #
SAND-84-1698 ..... N85-21802 #
SAND-84-2078C ..... N85-21299 #
SAND-84-8187 ..... N85-21808 #
SAND-84-8238 ..... N85-21623 #
SAND-84-16550 ..... N85-21626 #

SAPR-1 ..... N85-22266* #
SAPR-2 ..... N85-22266* #
SAPR-3 ..... N85-22266* #
SAPR-4 ..... N85-22266* #
SAPR-5 ..... N85-22266* #
SAPR-6 ..... N85-22266* #

SAR-47 ..... N85-21268* #

SC5357.2TR ..... N85-21304 #

SD-TR-84-47 ..... N85-21236 #
SD-TR-84-54 ..... N85-21505 #

SE-36 ..... N85-21869 #

SERI/TP-214-2563 ..... N85-21714 #
SERI/TP-217-2530 ..... N85-21805 #
SERI/TP-251-2413 ..... N85-21378 #
SERI/TP-252-2332 ..... N85-21800 #

SERI/TR-252-2164 ..... N85-21771 #
SERI/TR-253-2120 ..... N85-21770 #
SERI/TR-255-2177-VOL-1 ..... N85-21377 #

SGD-479-PT-1 ..... N85-22333* #
SGD-480 ..... N85-22332 #
SGD-483-PT-1 ..... N85-22335 #
SGD-483-PT-2 ..... N85-22336 #

SR-2 ..... N85-21581 #
SR-6 ..... N85-21832 #

SRA-R84-920014-F ..... N85-21582 #
SRA-R85-920016-F ..... N85-22186 #

SS-67-7 ..... N85-21412 #

SU-CSSA-ASTRO-85-14 ..... N85-22330* #

SU-FTR-E715-2 ..... N85-21470 #

SU-JIAA-TR-53 ..... N85-21170 #

SU-SLAC-PUB-3454 ..... N85-21526 #
SU-SLAC-PUB-3472 ..... N85-22127 #

SU-SLAC/AP-33 ..... N85-22117 #

SU-SOL-84-5 ..... N85-22073 #
SU-SOL-84-7 ..... N85-22028 #

SU-SR-D208-1983-1 ..... N85-22327* #

SU-TR-30 ..... N85-22100 #
SU-TR-222 ..... N85-22100 #
SU-TR-352 ..... N85-22062 #

SWRI-7557 ..... N85-21365 #

SYRU/DECE/TR-84/8 ..... N85-21473 #

TAE-563 ..... N85-21688 #

TDCK-79658 ..... N85-21308 #
TDCK-79703 ..... N85-21171 #

TECHNIQUES-AMERICAINES-SER-140 ... N85-22263 #

TN-215 ... N85-21126 #
TN-216 ... N85-21126 #

TOP-6-2-070 ... N85-21142 #
TOP-8-2-160 ... N85-21140 #

TP-2 ... N85-21814 #

TPR-7 ... N85-21503 #

TR-1 ... N85-22087 #
TR-1-ONR ... N85-21286 #
TR-2 ... N85-21291 #
TR-4 ... N85-22184 #
TR-5 ... N85-22070 #
TR-5 ... N85-22183 #
TR-6 ... N85-21290 #
TR-6 ... N85-22187 #
TR-7 ... N85-21294 #
TR-8 ... N85-21288 #
TR-15 ... N85-21295 #
TR-16 ... N85-21287 #
TR-27 ... N85-21473 #
TR-29-REV ... N85-22061 #
TR-39 ... N85-22005 #
TR-40 ... N85-22017 #
TR-53 ... N85-22082 #
TR-63 ... N85-21709 #
TR-81 ... N85-22008 #
TR-83-44 ... N85-22249 #
TR-84-5 ... N85-22083 #
TR-84-7 ... N85-21853 #
TR-84-42 ... N85-22065 #
TR-98R ... N85-22066 #
TR-124 ... N85-21285 #
TR-212-1 ... N85-21173* #
TR-213 ... N85-21680 #
TR-274-SER-2 ... N85-22086 #
TR-0084A(5945-01)-2 ... N85-21505 #

TR008 ... N85-21916 #
TR009 ... N85-21617 #

TT-8303 ... N85-21154 #

TUM-I8406 ... N85-22000
TUM-I8410 ... N85-22048

UAG-89 ... N85-21867 #

UCID-20156 ... N85-21864 #
UCID-30209 ... N85-22029 #

UCLA-ENG-84-39 ... N85-21517 #

UCLA-12/1463 ... N85-21827 #
UCLA-15 ... N85-21517 #

UCRI-91568 ... N85-21521 #

UCRL-90511 ... N85-22322 #
UCRL-90636 ... N85-21621 #
UCRL-90743 ... N85-21681 #
UCRL-90949-REV-1 ... N85-22170 #
UCRL-91123 ... N85-21646 #
UCRL-91451 ... N85-21904 #
UCRL-91581 ... N85-21338 #
UCRL-91670 ... N85-21647 #
UCRL-91763 ... N85-21715 #

UDR-TR-81 ... N85-22151 #

UIC/DQM/A84-3 ... N85-22084 #

UILU-ENG-84-2501 ... N85-21850* #
UILU-ENG-84-2502 ... N85-21851* #
UILU-ENG-85-0502 ... N85-21283* #

UK/DC/TR-6 ... N85-21374 #

UM-MEAM-84-22 ... N85-22041 #

UMTA-IN-11-0009-84-2 ... N85-22042 #

US-PATENT-APPL-SN-121937 ... N85-21281
US-PATENT-APPL-SN-175452 ... N85-21347*
US-PATENT-APPL-SN-214839 ... N85-21600
US-PATENT-APPL-SN-234222 ... N85-21568*
US-PATENT-APPL-SN-242797 ... N85-22139*
US-PATENT-APPL-SN-256585 ... N85-21428*
US-PATENT-APPL-SN-258500 ... N85-21405
US-PATENT-APPL-SN-275909 ... N85-21491*
US-PATENT-APPL-SN-288267 ... N85-21347*
US-PATENT-APPL-SN-291645 ... N85-21992*
US-PATENT-APPL-SN-308201 ... N85-21349*
US-PATENT-APPL-SN-308972 ... N85-21993
US-PATENT-APPL-SN-315327 ... N85-21602
US-PATENT-APPL-SN-322317 ... N85-21846*
US-PATENT-APPL-SN-322321 ... N85-21651*
US-PATENT-APPL-SN-324346 ... N85-21637
US-PATENT-APPL-SN-330281 ... N85-22176
US-PATENT-APPL-SN-338396 ... N85-21501
US-PATENT-APPL-SN-343042 ... N85-21434
US-PATENT-APPL-SN-352827 ... N85-21598*
US-PATENT-APPL-SN-361217 ... N85-22104*
US-PATENT-APPL-SN-364098 ... N85-22106
US-PATENT-APPL-SN-366732 ... N85-21603
US-PATENT-APPL-SN-366746 ... N85-21500
US-PATENT-APPL-SN-367132 ... N85-21427*
US-PATENT-APPL-SN-367136 ... N85-21596*
US-PATENT-APPL-SN-373084 ... N85-21436
US-PATENT-APPL-SN-375620 ... N85-21723*
US-PATENT-APPL-SN-375621 ... N85-21633
US-PATENT-APPL-SN-375684 ... N85-21769*
US-PATENT-APPL-SN-375784 ... N85-21266*
US-PATENT-APPL-SN-383086 ... N85-21639*
US-PATENT-APPL-SN-383867 ... N85-22140
US-PATENT-APPL-SN-384292 ... N85-21635
US-PATENT-APPL-SN-386127 ... N85-21599
US-PATENT-APPL-SN-387648 ... N85-21650*
US-PATENT-APPL-SN-393582 ... N85-21649*
US-PATENT-APPL-SN-393834 ... N85-21172
US-PATENT-APPL-SN-398132 ... N85-21601
US-PATENT-APPL-SN-402403 ... N85-22141
US-PATENT-APPL-SN-403848 ... N85-21493*
US-PATENT-APPL-SN-415879 ... N85-21652*
US-PATENT-APPL-SN-417726 ... N85-21495
US-PATENT-APPL-SN-418952 ... N85-21984
US-PATENT-APPL-SN-422430 ... N85-22156
US-PATENT-APPL-SN-423016 ... N85-21631*
US-PATENT-APPL-SN-425205 ... N85-21595*
US-PATENT-APPL-SN-432215 ... N85-22142
US-PATENT-APPL-SN-435522 ... N85-21497
US-PATENT-APPL-SN-437655 ... N85-22177
US-PATENT-APPL-SN-440656 ... N85-21348*
US-PATENT-APPL-SN-444003 ... N85-21502
US-PATENT-APPL-SN-445639 ... N85-21435
US-PATENT-APPL-SN-445646 ... N85-21437
US-PATENT-APPL-SN-445887 ... N85-21655
US-PATENT-APPL-SN-452604 ... N85-21632
US-PATENT-APPL-SN-461424 ... N85-21654
US-PATENT-APPL-SN-461427 ... N85-21433
US-PATENT-APPL-SN-461724 ... N85-21404*
US-PATENT-APPL-SN-461788 ... N85-21349*
US-PATENT-APPL-SN-462497 ... N85-21279*
US-PATENT-APPL-SN-465213 ... N85-21653
US-PATENT-APPL-SN-467430 ... N85-21499
US-PATENT-APPL-SN-468781 ... N85-22175
US-PATENT-APPL-SN-469176 ... N85-21496
US-PATENT-APPL-SN-469370 ... N85-21494
US-PATENT-APPL-SN-471417 ... N85-21354
US-PATENT-APPL-SN-473496 ... N85-21256*
US-PATENT-APPL-SN-475664 ... N85-21656
US-PATENT-APPL-SN-484329 ... N85-21161
US-PATENT-APPL-SN-486470 ... N85-21768*
US-PATENT-APPL-SN-486471 ... N85-21492*
US-PATENT-APPL-SN-488249 ... N85-21396
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US-PATENT-CLASS-310-22 ... N85-21404*
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US-PATENT-CLASS-343-5W N85-21846*
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US-PATENT-4,489,239 ..... N85-21631*
US-PATENT-4,489,243 ..... N85-21769*
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US-PATENT-4,491,427 ..... N85-21651*
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US-PATENT-4,494,838 ..... N85-21601
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US-PATENT-4,495,466 ..... N85-21603
US-PATENT-4,495,501 ..... N85-21436
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US-PATENT-4,495,520 ..... N85-21427*
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US-PATENT-4,495,782 ..... N85-21636
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USAAVSCOM-TM-84-A-10 ..... N85-21113* #

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USAFA-TR-84-7 ..... N85-21104 #

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VPI-E-84-5 ..... N85-21719 #
VPI-E-84-9 ..... N85-21271* #
VPI-E-84-36 ..... N85-21720* #

VTT-301 ..... N85-21682 #

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YM-15-00400 ..... N85-21750* #
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